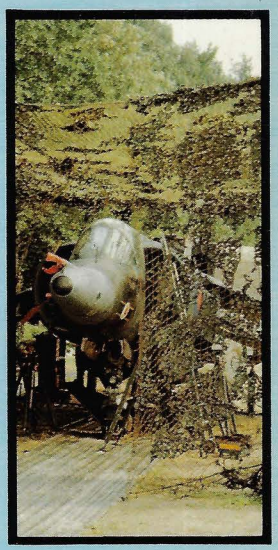
AIRFIX ANNUAL

for AIRCRAFT MODELLERS



Edited by
Bruce Quarrie

For the first time, an Airfix Annual specially for aircraft modellers!* Crammed with photographs and drawings on a wide variety of topics, from vintage biplanes and World War 2 machines to modern jets and transports, it is a real treasure house of information and will provide inspiration for dozens of models to suit all ages and tastes. USAF fighters in Korea, Bomber Command nose artwork and RAF Airacobras — all illustrated in full-colour — are just a few of the fascinating topics covered. You simply can't afford to be without it!

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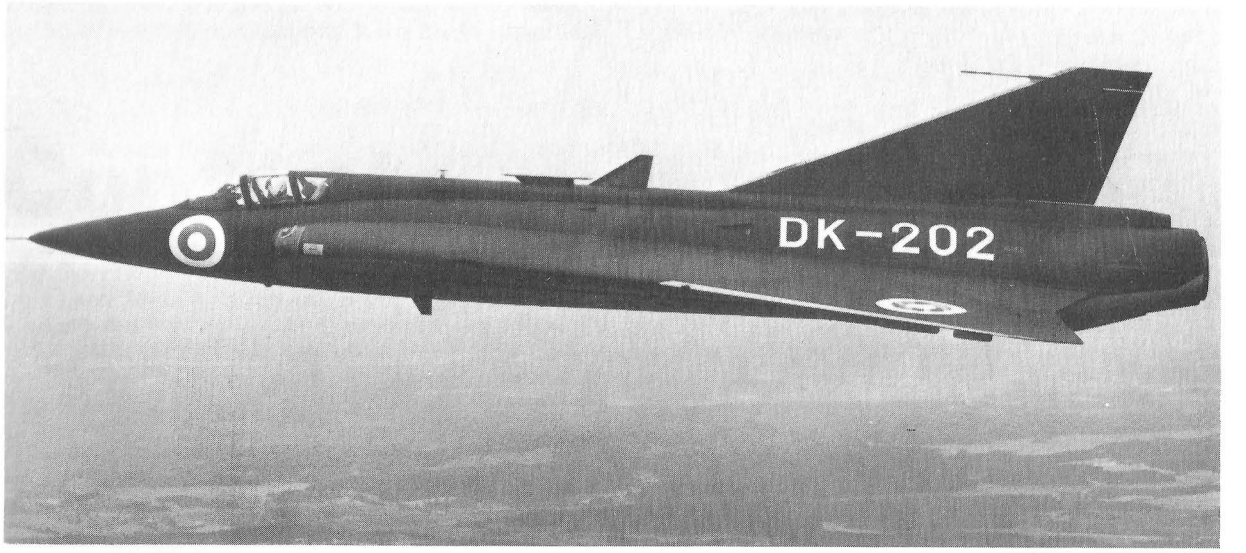

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Editor's introduction

A warm welcome to the first *Airfix Annual for Aircraft Modellers.* This exciting new book has been produced in response to requests from readers of the previous *Airfix Magazine Annuals* for more specialised treatment of their own subjects which would make the book more relevant for them, and you can judge the result for yourself.

The increasing trend amongst modellers seems to be towards greater and deeper specialisation in one subject or group of related subjects, and this Annual has been designed to meet the requirements of those who build aircraft, be they biplanes, World War 2 bombers or modern jets. A separate volume is available for any of your friends who specialise in military vehicles, figures or wargaming.

It is remarkable that, although the last three subjects have attracted huge numbers of devotees over recent years, the majority of modellers, whatever the medium they work in, are still more interested in aircraft than anything else with the possible exception of railways.

Airfix Products have always been well to the fore in stimulating this interest, firstly with their extensive ranges of 1:144 and 1:72 scale models, and more recently with their superb 1:24 scale series and the new 1:48 scale kits. All of these are readily available, while articles in *Airfix Magazine,* Airfix books and other publications have given impetus to the 'do-it-yourself' urge which exists in all of us, whereby proprietary products may be turned into totally different model subjects through converting and scratch-building.

This book includes ideas for both forms of modelling as well as plans and photographs for other subjects which lend themselves to re-creation in miniature, such as thematic collections of aircraft from RAF Germany or the Sultan of Oman's Air Force, for example. Such thematic collections often involve little more work than a few minor detail alterations easily discernible from photographs, and a new paint scheme. Other examples in this book are RAF Airacobras, Far East fighters, post-war trainers, Royal Marine helicopters or Korean War machines. A couple of other subjects which involve more work with the plastic card and putty are described in more detail, such as Gerald Scarborough's imaginative Hampden kit conversion, Neville Franklin's 1:24 scale Spitfire IX or Bryan Philpott's Lancaster Mk II, while there are also features on individual aircraft types such as the Hawker Hart and Saab Draken.

So there is ample material here for virtually any aircraft modeller, aided by the numerous photos, colour pages and drawings; but remember that the Airfix model range is constantly expanding and that similar ideas and subjects are covered every month in *Airfix Magazine.*

Bruce Quarrie

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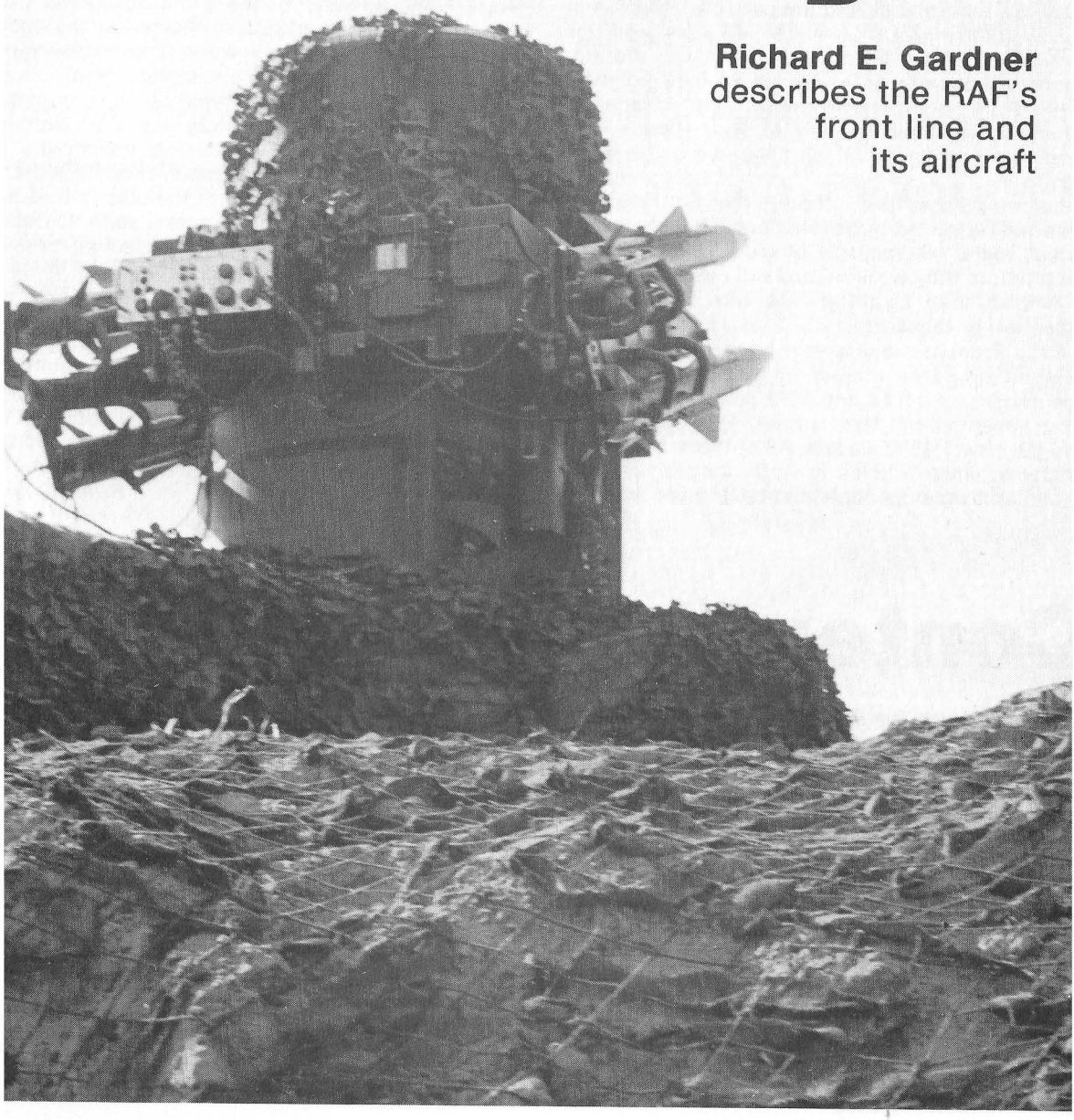
RAF Germany

Richard E. Gardner describes the RAF's front line and its aircraft



Left *A Rapier SAM used for airfield defence by the RAF Regiment, with a Lightning overhead.* **Above** *Phantom FGR 2 of 19 Squadron landing at Wildenrath with Bloodhound SAMs in the background.*

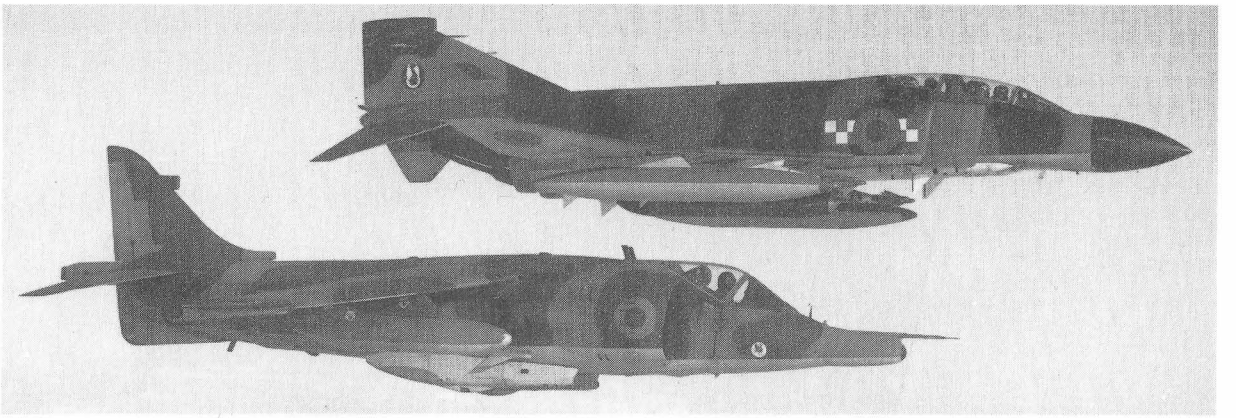
In recent years the Royal Air Force has undergone a series of major Command re-organisations which have resulted in the creation of a much neater support organisation and just two operational front-line Commands — Strike Command and RAF Germany. The latter is the sole remaining permanently overseas-based RAF Command and represents the new front line in every possible sense. With the huge firepower of the Warsaw Pact situated but a few minutes' flying time away, it is to the squadrons of RAF Germany that Britain and NATO look for air power in the central region of Western Europe.

The importance of RAF Germany to UK and NATO defence is reflected in the equipment allocated to the Command. All operational squadrons have modern, sophisticated weapons at their disposal, with even better replacements in the pipeline and, more importantly, are trained to fly and fight in realistic war situations. Even the most highly developed combat aircraft would be of very limited use in war unless the crews — from pilots and navigators to armourers and ground technicians — were trained to work round-the-clock under strict exercise conditions. These exercises, which can last several days, are conducted in simulated war environments with operations staff sealed away in blast-proof shelters and aircraft dispersed around airfields (also in shelters) and everyone clad in special protective clothing. Behind the sleek aircraft is a well prepared 'army' of RAF support personnel geared to keeping machines operational through likely air-raids and other attacks.

The re-equipping of the front-line squadrons has only been completed within the last year or so, after a decade of interim changes. Before looking at the present scene it is as well to consider the Command's aircraft in the 1960s. In the late 1960s, at a time when most NATO air forces were introducing supersonic combat aircraft into their inventories, RAF Germany was still flying ageing Hunters and Canberras, and had only one truly supersonic type, the Lightning.

The Hunter, which had been the close-support and tactical reconnaissance aircraft, was replaced by the Harrier GR Mk I at RAF Wildenrath in 1970. Serving with Nos 3, 4, and 20 Squadrons, the latter equipped with a special camera pod, the Harrier brought a new order of immediate close support for Army battlefield operations. Over the years the very complicated logistic back-up required for dispersed Harrier operations has been developed to a fine art. In the early days there were many problems associated with moving complete squadrons into the field, but today the Harrier deployments are mere routine, though still unique in the world.

The Harrier Force now consists of two large squadrons (Nos 3 and 4) based at RAF Gutersloh — close to the Army units to which it would be assigned in war. The Force is fully mobile and takes everything — from spare Harrier engines to field kitchens and all the groundcrew and local defence personnel — necessary to sustain intensive flying operations away from the 'home comforts' of RAF Gutersloh. The whole concept of the Force is to keep close to the battlefield whilst avoiding the counter-strikes expected at all fixed and well-known bases. Split into small detachments of half-a-dozen or so Harriers the sites are situated in exercise areas and farms. In war, Harriers could rapidly 'vanish' into either urban areas or countryside. Their survivability would compensate for their small numbers and aircraft-for-aircraft they could equate to a far larger number of conventional



A 19 Squadron Phantom flying alongside a 3 Squadron Harrier in early 1977 when both types were based at Wildenrath.

close support machines.

The Canberra was still being used as a bomber in Germany until 1970/71 but was replaced by a mix of Phantoms and Buccaneers based at Bruggen and Laarbruch respectively. The Phantom FGR Mk 2 was a truly multi-role aircraft capable of carrying SNEB rockets and bombs in addition to four Sidewinder air-to-air missiles, four longer-range Sparrow AAMs and a cannon pod. The Phantom squadrons included Nos 14, 17, and 31, all in the strike/attack role and No 2 Squadron which was fitted with a highly sophisticated reconnaissance pod for all-weather reconnaissance.

Following the large-scale introduction of the Jaguar from 1975 onwards, Phantoms became available to replace the long-serving Lightning interceptors. The green-painted Lightning F2As were phased out with Nos 19 and 92 Squadrons during 1976/77 and Phantoms, now specialising in the air defence role, moved to Wildenrath. The greater range and weapons capability of the Phantom give it a rather better combat air patrol performance in comparison to the Lightning, although the latter has a higher top speed and more manoeuvrability.

The Buccaneer serves with Nos 15 and 16 Squadrons in the long range strike/attack role. The Mk S2B is the last version of the sturdy Buccaneer to be built and most of the aircraft in RAF Germany are new machines with up-rated equipment and enlarged bomb-bays with extra fuel. Weapons can be carried internally or on underwing pylons, together with pods designed to help the aircraft penetrate hostile airspace. For ultra low-level strike missions carrying a heavy weapons load the Buccaneer is the only bomber of its type in NATO service, with the exception of the F111. It will remain a very viable frontline machine until the next decade, by which time it will probably have reverted to a maritime support role.

The most important single aircraft type in RAF Germany service today is the Jaguar GR1. In 1977 No 20 Squadron, formerly a Harrier unit, reformed as the final Jaguar squadron, following the re-equipment of the Phantom squadrons over the 1975-76 period. A very compact warplane, the Jaguar has a superb weapons system and has become established as a highly accurate attack platform, able to deposit conventional, retarded or

Two Phantoms of 92 Squadron at low level over the German countryside.

A Jaguar of 20 Squadron blasts down Bruggen's runway.

cluster bombs within a few feet of a target. The Jaguar has a particularly strong undercarriage and can operate from road surfaces. As the engines are uprated it will be capable of flying from grass surfaces with a good load of bombs and underwing drop-tanks. This added flexibility increases its survival chances in war, even though all RAF Germany stations have comprehensive rapid runway repair facilities.

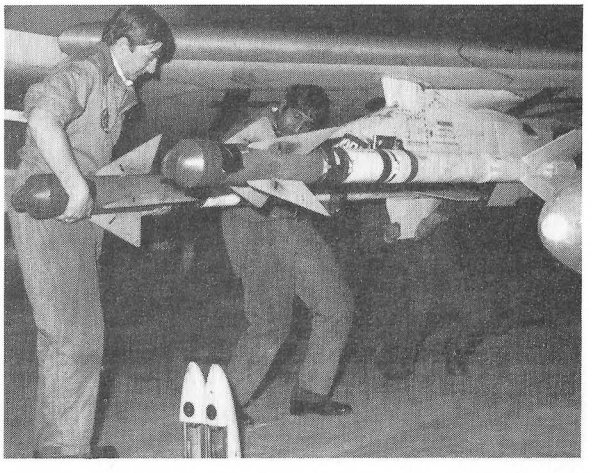
The old military airfield scene, with lines of prepared combat aircraft lined up in front of squadron hangars, has faded away in RAF Germany. The huge areas of concrete hard-standing stand largely empty, with hardly any sign of activity. On the surface all appears deserted. That is as it should be. For when the 'hooter' blows the air is quickly filled with the sound of dozens of engines starting simultaneously. Still no sign of movement. Then, from the far corners of the airfield, landing lights can be seen as blurred shapes drift into view. Within seconds it seems as if the whole area is alive with aircraft. As row upon row emerge from their well-protected shelters the term 'tone-down' takes on new meaning. A couple of minutes later and the first waves of Jaguars are blasting into the air. A few more minutes and all is quiet again. The huge steel doors have closed on all the shelters. Machine-gun posts are manned and all operational areas are sealed off from the rest of the air station. Out on the fringes of the base RAF Regiment Rapier missiles await the first enemy attacks. Menacing Bloodhound missiles point skywards anxious to rob the Rapiers of the chance to catch any attacking aircraft so close to the airfield!

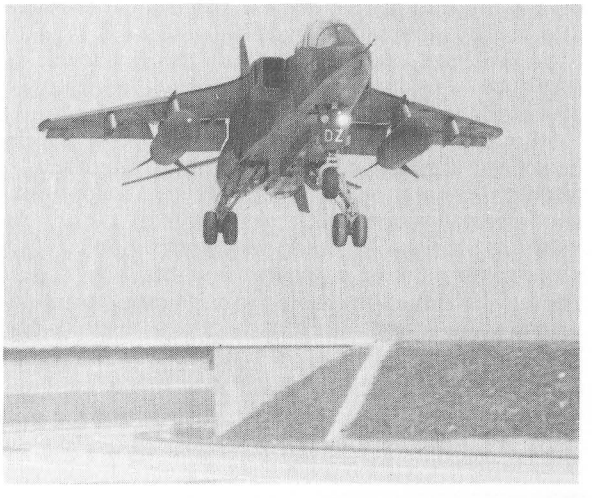
When the Jaguars return they taxi directly back to their hardened shelters (HAS) where they are winched backwards and behind closed doors. In a remarkably short time guns are re-loaded and bombs replaced. At the same time fuel tanks are re-filled and then the doors open . . . and the next sortie is underway.

This glimpse of normal operations in the RAF's new front line is applicable to any of the four major bases. In addition to the 'teeth' squadrons are the Wessex helicopters of No 18 Squadron at Gutersloh, and the Pembroke transports of No 60 Squadron at Wildenrath. As a fully integral component of NATO's Second Allied Tactical Air Force the RAF bases are frequent hosts to a wide range of visiting allied aircraft from USAFE F-15s to Norwegian F104s.

What of the future? The present mix of aircraft types will remain unaltered for some time although before the end of this decade the Buccaneers are due to be superseded by the Tornado GR1. Tornado will considerably increase the firepower of RAF Germany as it will be a truly all-weather strike/attack/reconnaissance aircraft able to fly fully automatically at tree-top height with a very heavy war load and pin-point bombing accuracy. In addition to carrying the most modern navigational and attack systems with moving map radar and head-up displays, Tornado will be equipped with a new generation of weapons and be fully supersonic. Missiles, bombs, reconnaissance and electronic counter-measures pods and fuel tanks can be fitted to seven pylons. An internal rapid-fire cannon is carried as well as air-to-air missiles.

Loading Sidewinder AAMs on to a 19 Squadron Phantom in a shelter.





A little later, after the introduction of the Tornado GR1, the air defence Phantoms will be replaced by the Tornado F2 armed with cannon, medium and short-range AAMs, and fitted with long-range air intercept radar. The Wessex helicopters will be replaced by Boeing Chinooks in the meantime, though the Pembrokes are expected to soldier on.

Plans for replacing the Jaguar and Harrier are now being prepared but as both these types have plenty of useful life ahead of them modification

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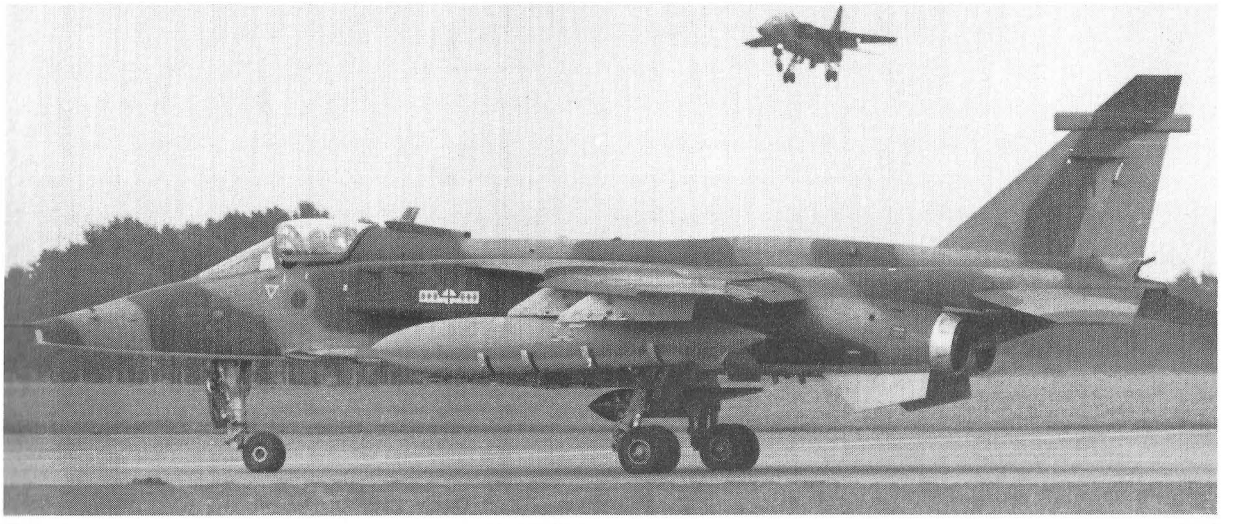
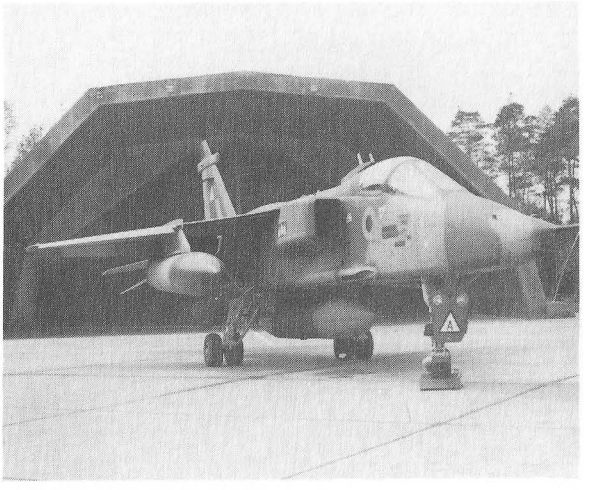
Top *Phantom showing off its formidable load of air-to-air weapons.* **Left** *The Jaguar is capable of operating from German autobahns should the need arise. Here a T2 is seen making a landing on a road during an off-base exercise.* **Below** *A Jaguar GR 1 of 17 Squadron arriving back at the dispersal after a sortie. The aircraft will turn through 180 degrees then be winched into its hardened shelter.*



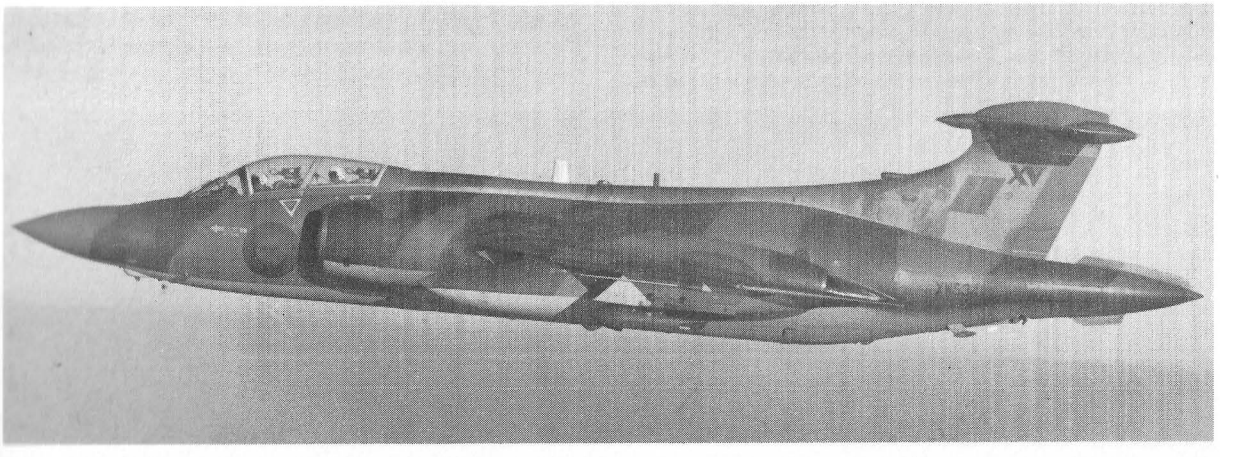
Top *A Jaguar T2 comes in to land at Bruggen as a 14 Squadron GR 1 prepares to take-off.* **Right** *Jaguar of 2 Squadron standing outside its hardened shelter.* **Below** *The sleek lines of a 15 Squadron Buccaneer. The black 'XV' on the tail has now been changed to white.*

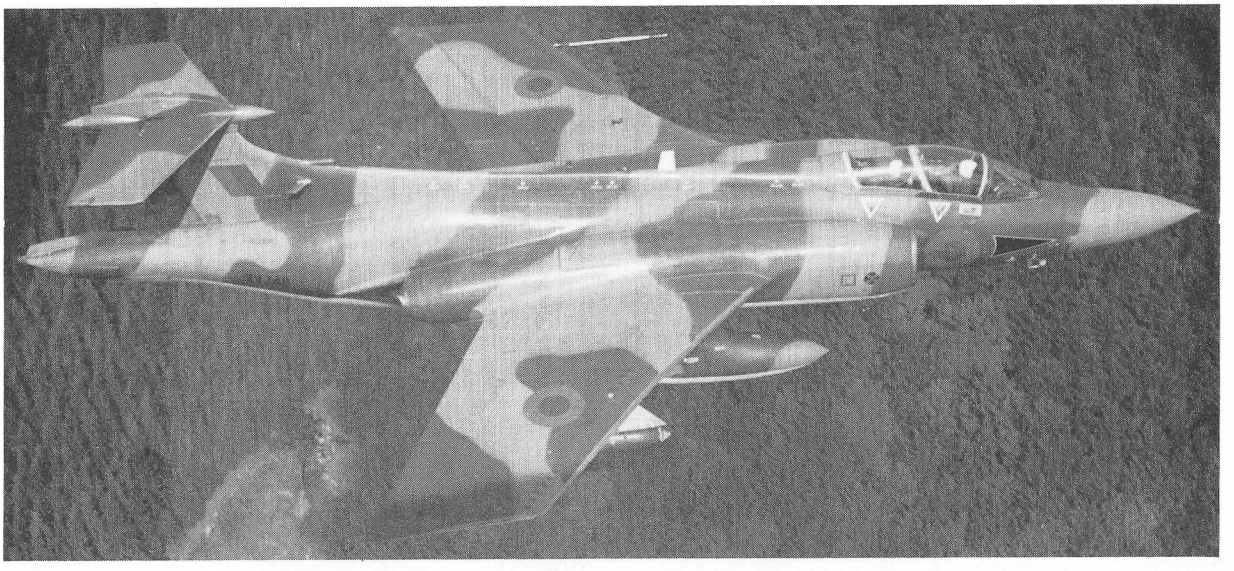


programmes improving their performances will keep them viable for many years to come. Greater load-carrying modifications and fitting up-rated engines together with the adoption of new weapons will be some of the changes expected before complete replacement occurs.

Modelling the aircraft of RAF Germany

An interesting 1:72 scale collection of models depicting RAF Germany aircraft can be built up



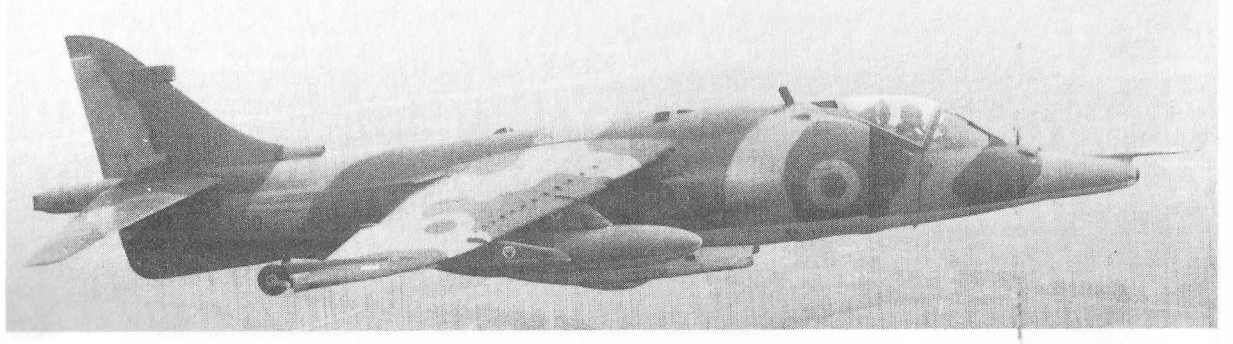


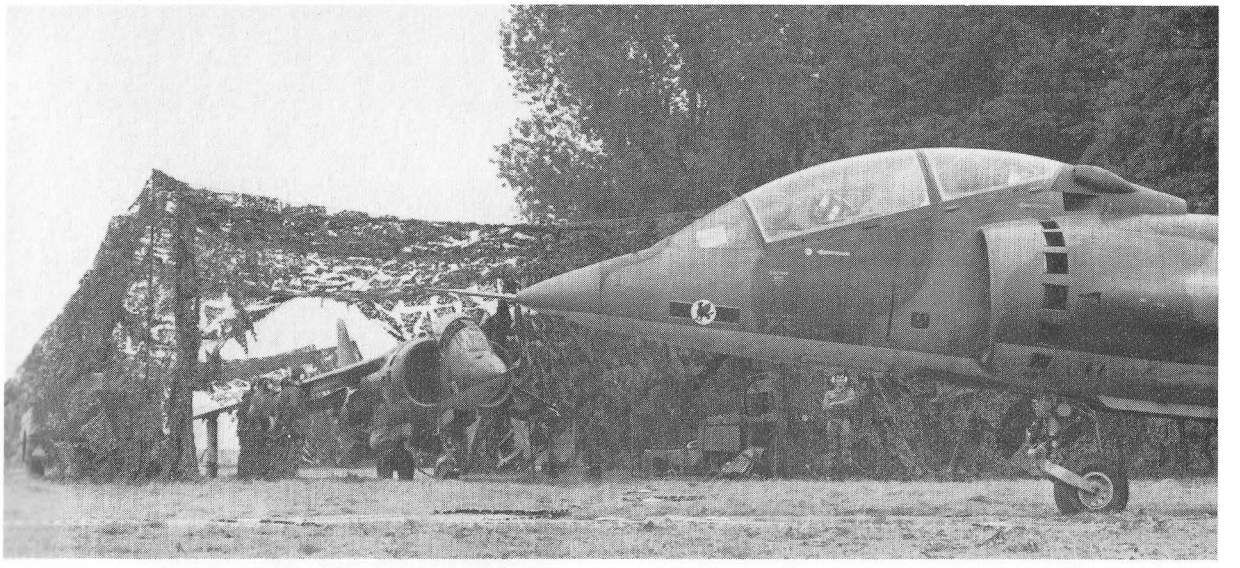
using existing and slightly modified plastic kits. The following notes might be of interest to those contemplating such a project.

Top *Buccaneer S2B of 16 Squadron flying over the German forests.* **Above** *Buccaneer with ECM pod and three 1,000 lb bombs flying over a winter landscape.* **Below** *A new Harrier GR 3 with laser nose and RWR tail fairing. Note hard demarcation lines between camouflage colours.*

Buccaneer The only production Mk S2B available is a Matchbox kit. This contains markings for either Nos 15 or 16 Squadrons. Unfortunately this particular model has a complete lack of underwing pylons and stores which must be added from the spares box. 1,000 lb or cluster bombs from the Airfix Tornado or Jaguar kits could be used. It should be noted that no flight-refuelling probes are fitted to RAFG Buccaneers. Modeldecal provide a fine set of replacement transfers with much added detail including small stencils, but the yellow 'walkway' lines should be deleted as they look too prominent in 1:72 scale. Extra blade aerials can be added to spine and tail as in photographs.

Jaguar There are several good kits available of the Jaguar. The revised Airfix model is the newest to appear and contains the best selection of external stores. Jaguars in RAF service carry twin fuel tanks on the inner wing pylons rather than the single tank provided with the kit. A reconnaissance pod can be modified from a fuel tank and placed in the ventral position. Typical war-loads would comprise HE or cluster bombs on the outer pylons and below the fuselage. Squadron identification codes appear in white-outlined black on the tail. Camouflage colours continue around all surfaces. Modeldecal provide transfers for most of the RAFG





A Harrier T2 taxies from its hide past a GR 3 of 3 Squadron. The GR 3 has the old 'sharp' nose.

squadrons, and also detailed painting instructions. The old Frog Jaguar kit contained alternative parts for a T2 two-seater conversion. The Heller kit also contains T2 components.

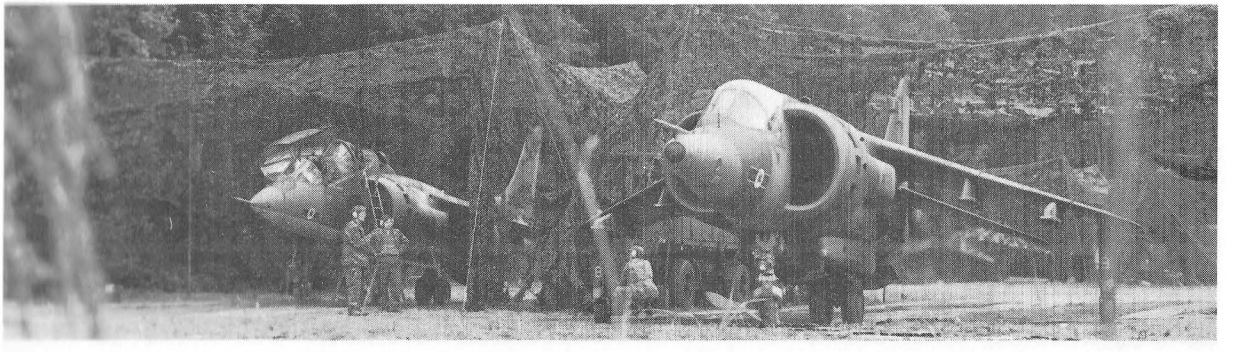
Harrier Airfix, Matchbox and Hasegawa produce 1:72 scale models of the Harrier. The Airfix model provides a good selection of stores although it is a comparatively old kit. The laser nose, fitted to all single seaters, can be added by utilising the rear part of the recce pod from the Airfix kit. The pointed nose is simply sawn off, after the fuselage has been joined, and the new nose cemented into position, with a longer pitot tube fitted above. The RWR housing on the tail can be added from plastic card. A two-seater conversion was produced by Air Conversions but may now be difficult to obtain. Transfers for Nos 3 or 4 Squadron Harriers are available from Modeldecal. Camouflage colours continue around all surfaces.

Phantom The Phantom FGR2 can be modelled either from the Matchbox kit or modified from the F4J version provided in the Airfix kit. Decals can be used from the Modeldecal Lightning sheets — which include both Nos 19 and 92 Squadrons. The red/yellow markings of No 92 and pale blue/white of No 19 can be repainted over the black/white markings of No 43 Squadron or hand painted completely. Representative weapons would comprise Sidewinders, Sparrows and gun-pod. Bombs and Matra pods should not be carried for a current RAFG Phantom.

Hunter T7 Modified two-seat Hunter T7s are used for crew familiarisation flying with the Buccaneer squadrons. They are painted in standard camouflage colours and have drop tanks on the inner wing pylons. The only T7 available in kit form is from Matchbox. These aircraft do not carry squadron colours at present.

Wessex HC2 The Frog/Novo Wessex has been around for a very long time and is therefore rather crude by modern standards of kit production. The basic shape, however, is accurate and capable of conversion into an HC2. The degree of effort put into the conversion depends on individual tastes but three changes are called for. The twin engine

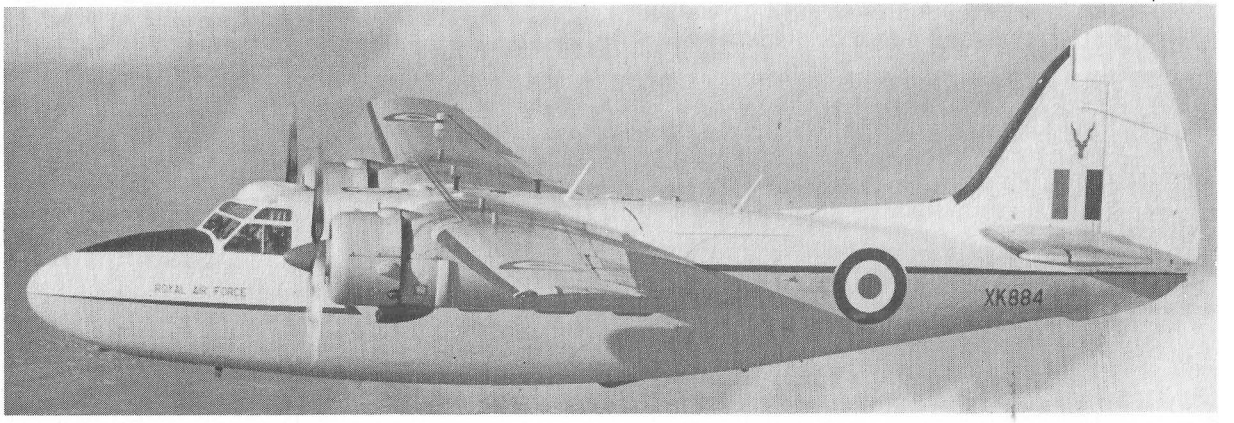
Harrier hides during Exercise Hack Fist in 1977. The GR 3 is in the overall camouflage scheme adopted for close-support aircraft and is fitted with laser nose, known as 'snoopy nose'.



Top *Reconnaissance Jaguar GR 1 of 2 Squadron showing its BAC-designed pod fitted below the centre-line pylon.* **Below** *Wessex helicopters hidden in the woods.* **Bottom** *A fine air-to-air study of a 60 Squadron Pembroke.*

exhausts of the kit must be replaced by new, larger outlets. The new exhausts can be made from sprue, drilled out at the ends or from sections of fuel tank 'bent' to shape over a candle. See the photographs for location details. The nose shape of the HC2 differs greatly from the Mk I of the kit and a new shape must be fashioned from wood or moulded from plastic card sheet. The third modification concerns the angular winch affixed to the cabin above the door. This can be made from plastic rod or stretched sprue. Optional 'extras' include detailing the cockpit interior, adding all cable ducts and aerials, adding new door in the open position with interior folding bench seats in the cabin, and foot holds beneath the main door. For those seeking an even more complex conversion, the rotor blades and tail unit can be rebuilt in the stowed position and a fully detailed engine compartment shown.

Pembroke No injection-moulded model of a Pembroke exists but a vacuum-formed kit was produced in 1976 and may still be available from the specialist model shops advertised in *Airfix Magazine.* □



Build a radial-engined LANCASTER MK II

Bryan Philpott shows how to convert the Airfix kit into a very different model

There can be little doubt that the Lancaster bomber and its exploits in World War 2 are as well-known as those of the Spitfire, Bf 109, B-17 and Zero, so it is perhaps a little odd that it has not received the same attention from the kit manufacturers. Leaving the superb Tamiya 1:48 scale model aside, the Lancaster has been produced in 1:72 scale by Airfix, Revell and Frog. The Airfix model, which is the most accurate, still soldiers on after nearly 20 years in production; the Revell model, which came in two versions, one of which was the B1 (Special) used by the Dambusters of No 617 Squadron, could be made into a decent replica, whilst the Frog, which was nicely moulded but had one or two irritating errors, now seems to have an uncertain future.

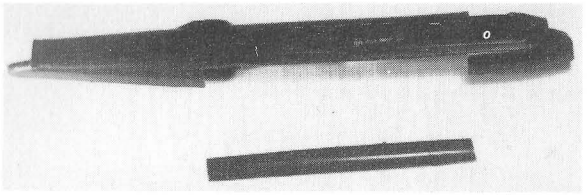
The fact that other major manufacturers appear to have overlooked the Avro bomber adds support to the argument that bomber kits do not sell as well as single-engined fighters, but against this it is possible to quote many examples of large aircraft which do not have the appeal of the Lancaster, yet have been kitted. With the present trend towards including alternative components which enable the basic model to be produced in various marks or sub-types, it is possible that before too long someone may take a closer look at this Bomber Command stalwart and produce a modern kit which will do it justice.

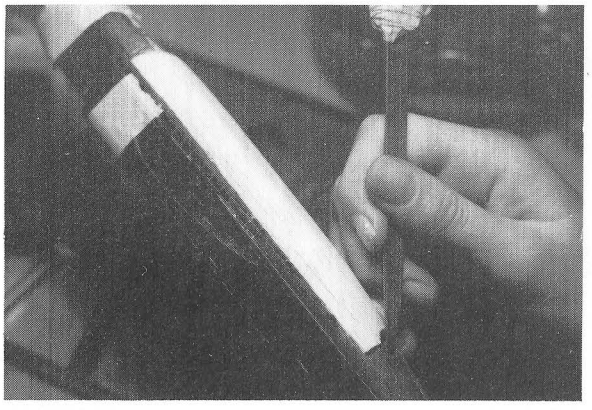
In the meantime, the veteran Airfix kit provides the basic material from which Lancaster variants can be produced, and one of the most attractive of these is the radial-engined Mk II.

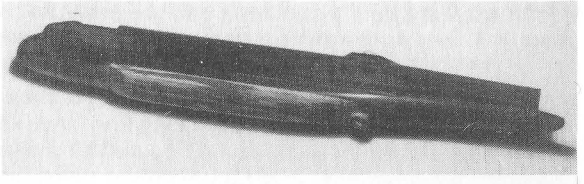
With the re-design of the ill-fated Vulture-engined Manchester to the Merlin-powered Lancaster, demand for the superlative Rolls-Royce power plant was considerably increased. To allow for any fall-off in production or disruption caused by possible enemy action, it was decided to make provision for a suitable alternative power plant for the Lancaster and the British Hercules air-cooled radial was chosen as a form of insurance. With the deployment of the Mk I airframe more-or-less off their hands, A. V. Roe's experimental department turned its attention to mating the Bristol engines to the aircraft.

The prototype (DT810) made its first flight on November 26 1941 and the following February was moved to the A & AEE at Boscombe Down for official type tests. Production of the Mk II was carried out by Sir W. G. Armstrong Whitworth Aircraft Ltd who had tooled up for the Manchester but continued with Whitley production when the Manchester contracts were cancelled.

The first two aircraft to be completed by Armstrong Whitworth rolled off the production line in September 1942 and were allocated to A & AEE for trials, but subsequent aircraft went to No 61 Squadron who acted as a service trials unit. 'C' Flight was formed to try the aircraft as well as carry out comparison tests with the Mk I which No 61 Squadron had been operating since April 1942. By January 1943 the squadron had nine Mk IIs on strength and on the night of January 11/12 they introduced them to operations for the first time in conjunction with their Mk Is for a raid on the Krupp works at Essen. Both Mk IIs returned early having failed to reach the briefed operational height of 22,000 feet, and a similar fate awaited the aircraft five nights later when engine trouble forced Wing Commander R. M. Coad to bomb a standby target instead of his







Top *Kit fuselage half with bomb bay cut away.* **Centre** *The balsa plug in place and the aperture for the ventral turret being cleaned up.* **Bottom** *The new bomb bay sanded smooth and the Dornier kit turret in place.*

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briefed target which was Berlin. Several other 'teething' problems beset the radial-engined Lancaster but the most serious was its persistent inability to reach heights comparable to those of its Merlin-engined brother.

Despite the problems none of the nine aircraft operating with No 61 Squadron were lost and they were all handed over to No 115 Squadron which became the first operational unit with the aircraft, which they accepted with gratitude as at that time they were still operating Wellingtons. The squadron worked up on the new aircraft and on March 30 made their operational debut with it when they carried out mining off the enemy coast.

At one stage in its development it had been mooted that the Mk II Lancaster would be an ideal aircraft for daylight operations since its air-cooled engines were not as vulnerable as the liquid-cooled Merlin engines. Although this proposal was shelved, squadrons operating the Mk II were soon able to prove the philosophy behind it as aircraft returned safely from ops with engine damage that would almost certainly have resulted in the loss of the machine if the liquid-cooled engines had been in use. Another legacy from the daylight proposal was the fitting of a FN64 ventral turret armed with two .303 Browning machine-guns which was often manned by an eighth crew member. On many Mark IIs this turret was removed as it was felt that it was not really necessary for night operations. In No 6 Group the Canadian squadrons still operating Wellingtons were converted to the Mk II and in September 1943 No 514 Squadron became the first new squadron to be formed with this mark of Lancaster from the outset.

Only six squadrons were fully equipped with the Mark II which was continually dogged by its inability to reach satisfactory operational heights, and although it took part in many important raids, by September 1944 it had been virtually phased out of operational service. By the end of the war only 16 of the original 301 Lancaster Mk IIs which were built, remained with the RAF. After the war LL735 was used by the RAE at Farnborough and Cranfield as a flying test bed having a Metrovick F2/4 jet engine installed in its tail.

Overall, the Lancaster Mk II cannot be claimed to have been an outstanding success, but there can be no doubt that if supplies of the Merlin engine had failed, further development work on the Bristol-engined version could well have produced as good an aircraft as the Mk I.

As some of the early Lancaster Mk IIs were not fitted with a bulged bomb bay or the FN 64 ventral turret there are two conversion possibilities, one marginally easier than the other. Enthusiasts who aim to build a collection of all aircraft used by Bomber Command in World War 2 may well feel that they want to tackle both, others who just want a different Lancaster for their collections can decide which of the two meets their particular skill level, although to be honest, the hardest part is the mating of the Hercules engines to the Lancaster wing which has to be done for either version.

As with many kits produced these days the Airfix Lancaster may well be found to have a surfeit of flash so the first step should be to clean-up all the kit mouldings by removing this. If the bulged bomb-bay version is being constructed, start by measuring 55 mm from the fuselage nose and scribe a line in this position; from this line measure 125 mm down the length of the marked bomb-bay and mark another line. Now take a razor saw and cut out the section between the two lines, making sure that the cuts are vertical to the aircraft's axis. It is best to use a razor saw for the cuts at each end and then use a sharp modelling knife in conjunction with a steel rule to join these cuts along the horizontal axis, the top edge of the moulded bomb-bay being a suitable guide. This work must be done before the two fuselage halves are joined together. Clean-up the area where the cuts have been made then assemble the cockpit floor and mid-upper turret and fit these components into one half. Join the two fuselage halves together leaving out the front and rear turrets. The latter components can be inserted prior to joining the halves but

if this is done they become very vulnerable when work is progressing on the bomb-bay. I found it best to leave the two turrets off then modify the bases so that they could be fitted to the fuselage when all the surgery and carving had been completed.

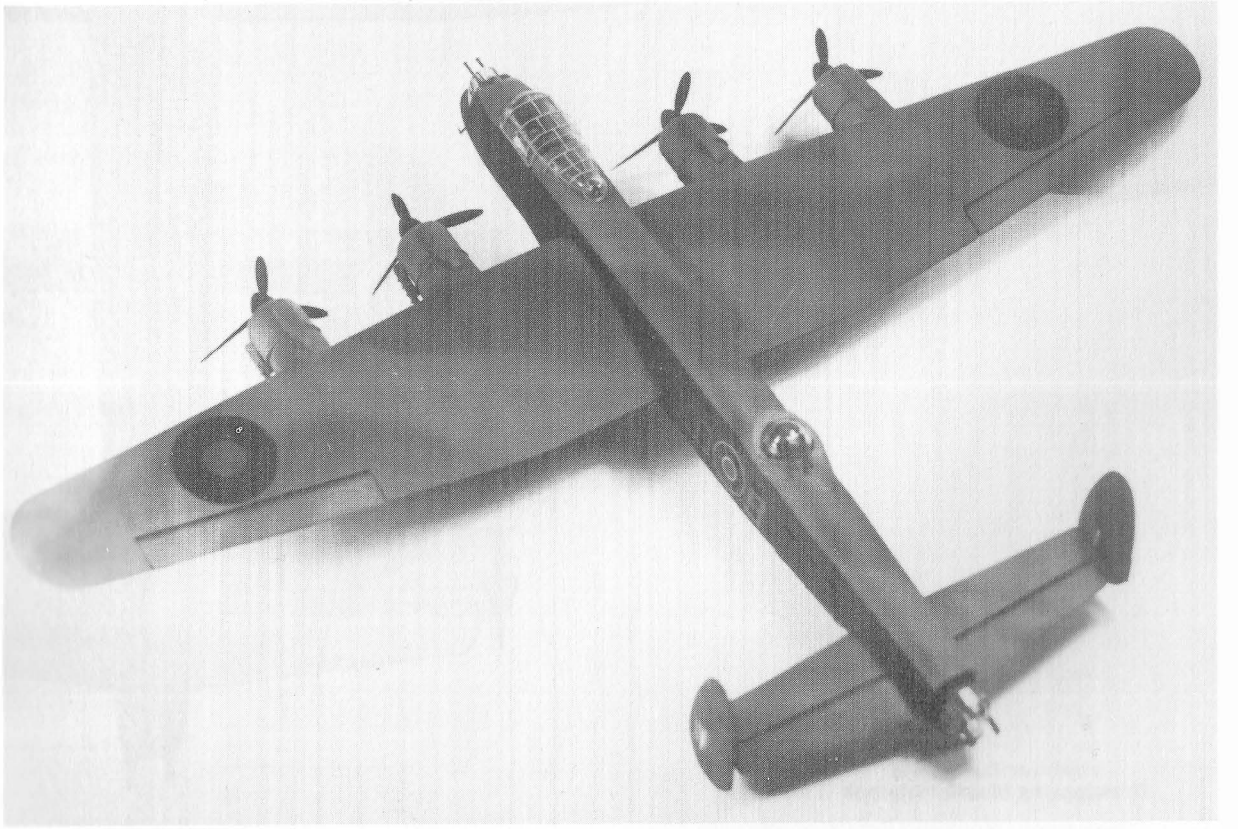
Once the fuselage has set, insert a piece of balsa wood into the area which has been removed, and cement this firmly in place, using elastic bands or masking tape to hold it tightly in position while the cement dries.

When the balsa block has bonded to the plastic, take a modelling knife with a new blade and carefully carve it to the contours of the bulged bomb-bay. Do not be over anxious to complete this work and make a lot of small cuts in removing unwanted balsa instead of one or two hefty ones. When the basic shape has been obtained, take a fairly fine grade sandpaper and complete the shaping with this.

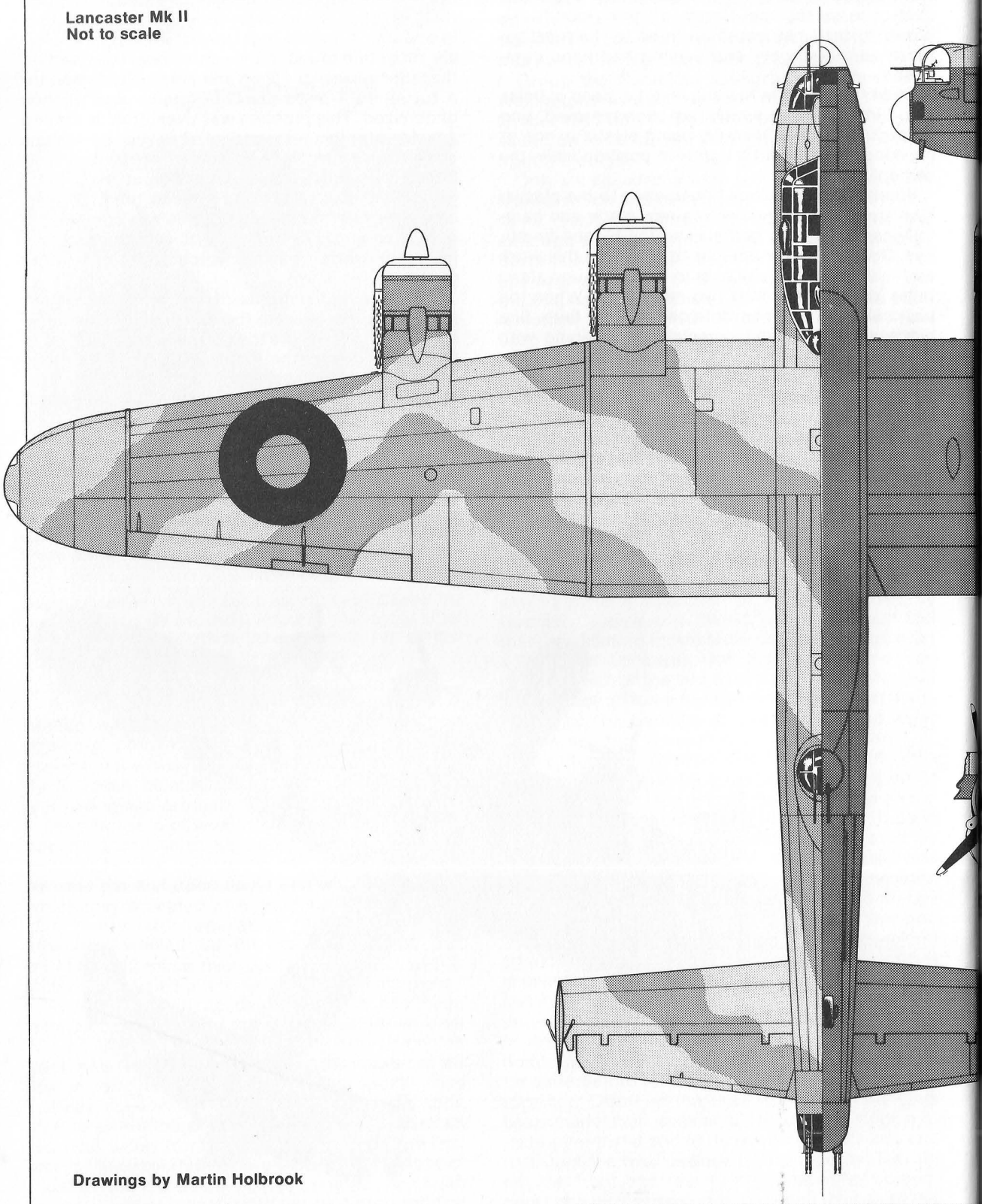
Final smoothing of the balsa is carried out with flour paper and when all blemishes have been removed the new section is treated to a coat of grain filler. I chose to make a fine paste by melting plastic strips in liquid cement then painted this over the balsa, sanding it to a fine smooth plastic finish when it had dried thoroughly. The sanding operations around the bulged bomb-bay will have removed the adjacent rivet detail from the moulded fuselage, so I then treated the rest of the fuselage to the same treatment until all traces of rivets had been removed. Since the ventral turret was often removed this can safely be omitted, but if you want to add one it must be cut from dowelling or a suitable substitute found in the spares box. I decided on the latter course of action and eventually settled for a turret from a Dornier 217, which was slightly undersized. This problem was overcome by drilling a hole into the rear end of the new bomb-bay, cementing the Dornier turret in place, then building-up its diameter with Milliput body putty which was also used to fair it into the bomb-bay area. When all the shaping of this was completed I used a small dental burr to drill two holes to take the machine-gun barrels which were made from stretched sprue.

The tops and bottoms of the wings were then joined together as were the halves of the Lancaster engines. The latter are too narrow when matched to the cowlings from the Airfix Halifax kit, but I chose not to widen the nacelles with strips of plastic card as this can affect the fitting of the undercarriage. Before cementing the nacelles to the wings, cut off the front sections 2 mm aft of the exhaust stubs, once again making sure that the cuts are truly vertical. Now locate the nacelles in position on the wings and when they are set file the bottoms of the outer engines flat. Next cut four discs 18 mm in

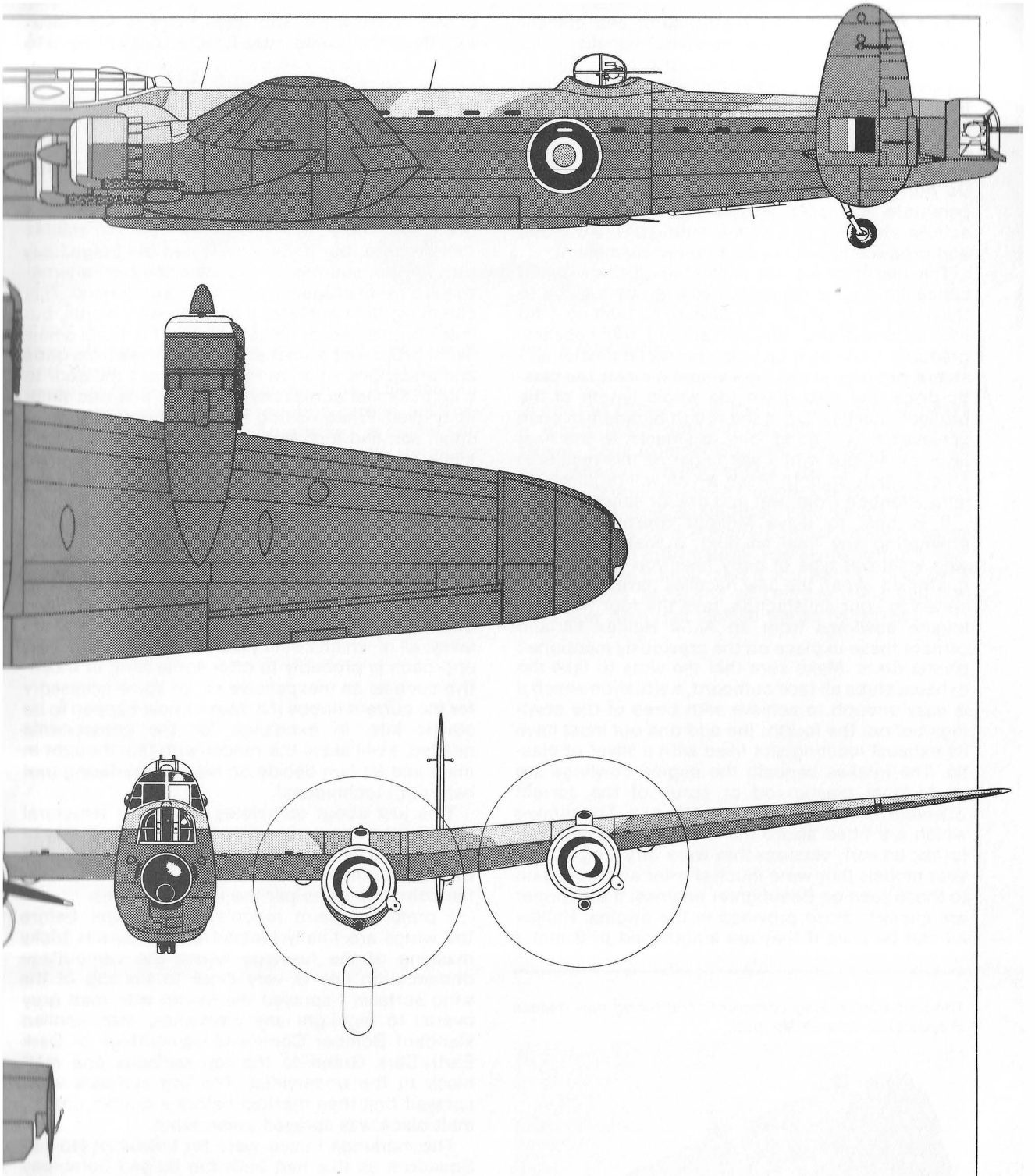
The completed model with its radial engines which give it a very different appearance.



Lancaster Mk II
Not to scale



Drawings by Martin Holbrook



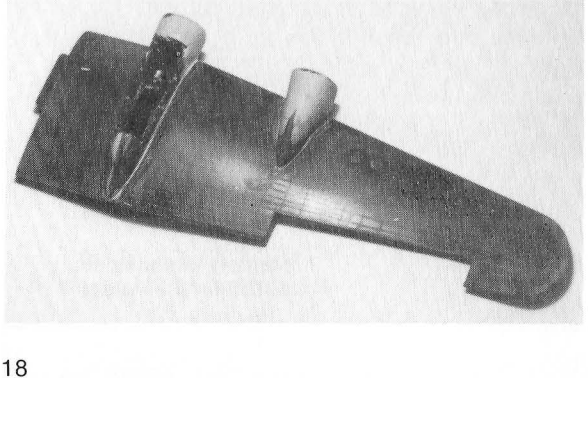
Multiply dimensions by 1.5 for 1:72 scale

diameter from 20 thou plastic card, and cement these to the front of the truncated nacelles. The easiest way to cut these discs is to use a pair of dividers set to 9 mm radius and with one point filed to a sharp cutting edge. By gently scribing the circle several times, the cutting edge will penetrate the plastic card and leave you with a perfect disc which only needs gentle sanding to clean its edges. Do *not* press too hard on the dividers or try to penetrate the card in one operation, as both actions are likely to alter the setting of the dividers and produce four discs of different diameters!

The plastic discs are cemented to the existing Lancaster engine nacelles, and used as a guide to the diameter to which they have to be built up. I did this by smoothing Milliput around the nacelles, gradually building it up to the correct diameter and shape, not only at the front where it meets the plastic discs, but also down the whole length of the original nacelles. Once the rough outline has been achieved it is a good idea to smooth in the final layer of Milliput with a wet finger as this results in an extremely smooth finish which will require very little attention from 'wet and dry' or sandpaper.

It is best to leave Milliput overnight before attempting any final shaping, a wise precaution with whatever type of body filler you use in large quantities. When the new nacelles have been completed to your satisfaction, take the four Hercules engine cowlings from an Airfix Halifax kit and cement these in place on the previously mentioned plastic discs. Make sure that the slots to take the exhaust stubs all face outboard, a situation which it is easy enough to achieve with three of the cowlings but not the fourth; the odd one out must have its exhaust locating slot filled with a sliver of plastic. The intakes beneath the engine cowlings are made from plastic rod or sprue of the correct diameter which is best shaped *in situ*. The intakes which are fitted above the cowlings can take two forms; on early versions they were very long and on later models they were much shorter and more akin to those seen on Beaufighter engines. If the former are chosen, those provided in the original Halifax kit can be used if they are lengthened by 3 mm. I chose to use these and fitted them to the model exactly as they came in the kit, then used Milliput to get the extra length as well as a filler where they do not exactly match the top line of the new cowling. Once this work was completed the exhaust stubs from the Halifax were also fitted, removing the locating pip from the one which does not have a location point and cementing this direct to the cowling.

The port wing during construction showing new nacelle shapes built up with Milliput.



If a model *without* the modified bomb-bay has been constructed the propellers from the Halifax can be used, but if you have fitted the bulged bay they are not suitable. In this case the best alternative is a set of props from an Airfix Sunderland. This can make the Lancaster II an expensive model, but there is little choice unless you want to build a new set of props and a smaller diameter boss from odds and ends. One solution I found opened the door to a lot of similar conversion problems and was simplicity itself. When visiting friends I noticed that their small son had a collection of very battered plastic kits which had been built as playthings and then discarded. Among these relics was a Sunderland which had been used for target practice with an air pistol and it did not take too much persuading to get the props from this wreck thus solving what could have been an expensive problem. There must be hundreds of cases where a smaller brother, nephew, or as in my case, a friend's child has many once cherished but now forgotten models hidden away, all of which could yield useful parts. The best approach is probably to offer some form of incentive such as an inexpensive kit, or some accessory for the current hobby if it doesn't now happen to be plastic kits, in exchange for the components needed. I will leave the reader with this thought in mind and let him decide on his own bartering (not battering) techniques!

This just about completes the major structural work on the conversion. It is now only necessary to sand off the rivets on the wings and tail unit so that they match the smooth fuselage, and assemble all the components as per the kit instructions.

I prefer to paint models of this type before the wings are finally located as this avoids tricky masking of the fuselage where the camouflage demarcation line is very close to the top of the wing surface. I sprayed the model with matt grey overall to highlight any blemishes, then applied standard Bomber Command camouflage of Dark Earth/Dark Green to the top surfaces and matt black to the undersides. The top surfaces were sprayed first then masked before a double coat of matt black was sprayed underneath.

The markings I used were for DS652 of No 115 Squadron as this had both the bulged bomb-bay and long intakes above the engines. All the markings came from Letraset sheets but the national markings provided in the standard kit will do just as well. Once these had been applied I filled my airbrush with a very diluted solution of white spirit and matt black paint, which I gently sprayed from about

Another view of the completed model clearly showing the new engine shape.

a foot distance over all the top surfaces. This effectively darkens down the Earth/Green camouflage and gives the model that 'used' appearance so essential for an operational machine. This technique is very effective but requires careful application and a lot of practice otherwise the model can end up looking as though it is matt black overall, or worse still, ready for the fire dump.

The final task was to add aerials including the beam approach strip under the rear fuselage, and the wheels to the oleos. The tyres were painted with dark grey as in my opinion this looks far more like rubber than matt black, and the centre wheel hubs highlighted with steel colour paint dry brushed on. Parts of the oleos were also picked out with a one to one mix of silver and steel, which again achieves a much more authentic appearance. In Phillip Moyes' book *Bomber Squadrons of the RAF* there are numerous photographs of the Mk II Lancaster which will enable you to capture the atmosphere of the aircraft, and Bruce Robertson's book, *Lancaster, the story of a famous bomber,* also provides much helpful information. The same author's *Profile No 235* is a must, and if you want to refer back to the *Airfix Magazine* of October 1968 you can read how Alan Hall tackled the same project. □

marking the TRAINERS

Michael J. F. Bowyer outlines the markings applied to RAF trainers from 1950 to 1978

In 1947 the Royal Air Force switched to aircraft colours for the post-war scene. These took some time to be applied, and not until 1950 had new features become general. This was as true of markings on trainers as on other types, so 1950 is a suitable time at which to begin a post-war survey of trainer markings.

In the first weeks of that year the de Havilland Chipmunk entered service, initially with Oxford and then with Cambridge University Air Squadron. With amazing speed these Chipmunks carried the four-letter identity markings of the period. Indeed, within five days of arrival at Cambridge, WB563 (Photo 1) appeared with RUC:B in black on its otherwise silver finish with yellow fuselage and wing 'training bands'.

Regular Flying Training Schools were using the Percival Prentice (Photo 2) which introduced a new pattern of training to replace the Harvard. Prentices left the production lines silver with yellow training bands and black serials. VS355 FB:RG in black used between April 1949 and September 1954 by 3 FTS Feltwell depicts typical markings wherein the individual identity 'RG' appears on the nose in black. The spinner is black too, and panels in the canopy are orange to make instrument and night flying training easier. Such an idea was first mooted in 1945 and tried, experimentally, on a Lancaster.

By 1952 four-letter identity markings had almost all been replaced by a new two-letter system which disguised unit identity at a time when the RAF was again expanding. Duplication of the letters between units made identity difficult and strength hard to assess. Harvard KF280 N:Q of 1 FTS (Photo 3), an aircraft that had seen wartime service, depicts this system. It was photographed at the huge 1953 Coronation Review at Odiham. Again, the finish is silver with yellow 'training bands', and like so many trainers it has a black anti-dazzle panel ahead of the pilot. This feature came into use in 1950, but was far from universal.

It was in 1953 that the Balliol T2 (Photo 4) came into general use, after a competition spanning some time between it and the Avro Athena. These were advanced trainers allowing pilots to proceed from the Prentice, and 7 FTS Cottesmore equipped in 1953, although the training system was often to be altered leaving the Balliol high and dry. WG134 wears the silver/yellow scheme with black letters D:D and a yellow spinner — how tempting it must have been to add some colour there.

In 1952 the Varsity entered service, intended to be a maid of all work in the trainer scheme, offering pilots training for multi-engined aircraft whilst navigators, bomb aimers and radio operators could practice their arts. Originally individual identity only was applied in black on the rear fuselage, later on the nose and finally on the fin. WF408 R photographed on May 15 1956 (Photo 5) wears silver

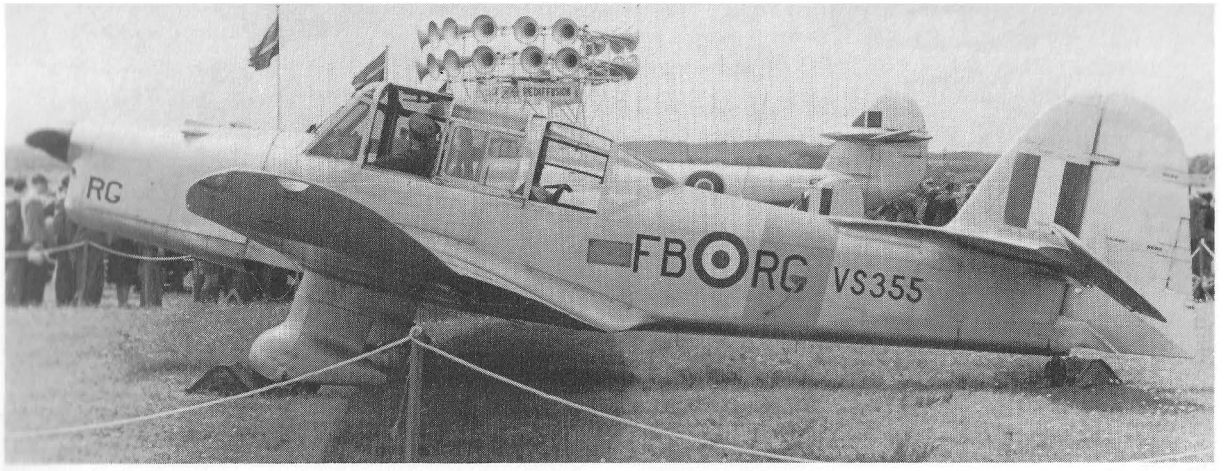


Photo 1 *(left) de Havilland Chipmunk of CUAS.* **Photo 2** *(above) Percival Prentice of 3 FTS.* **Photo 3** *(right) Harvard of 1 FTS.*

finish with yellow 'Training bands' typifying one early stage of the process. Unusually, however, it carries 'R' in green and was then based at 2 Air Navigation School, Thorney Island.

The mid-1950s witnessed few basic changes in markings although some units gave them an individualistic touch. Spinners, for instance, acquired Flight colours and the positioning of letters and numbers varied. Some units relied upon a number or mixed number-letter identity. A feature of this period was the addition to fighter and bomber squadrons of trainers in trainer colours used for continuation, instrument and night flying training. Sometimes these aircraft were assigned to Station Flights as was the case with Canberra T 4 WT479 (Photo 6) of Upwood Station Flight, which was photographed on September 14 1957. Its high-speed silver finish with yellow bands was usual, in this case being supplemented by six-inch black nosewheel door serials and the Upwood badge, a lion rampant in red on a white shield outlined black and applied to fin sides and tip tanks.

It was in June 1959 that the first major change in post-war trainer markings manifested itself, when dayglo (or dayglow — you take your choice) appeared in all its bright glory. By this time the Percival Provost T 1 had seen almost six years' ser-

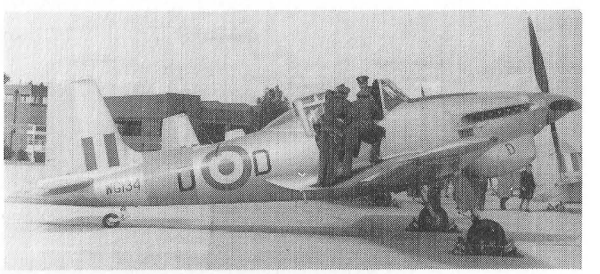
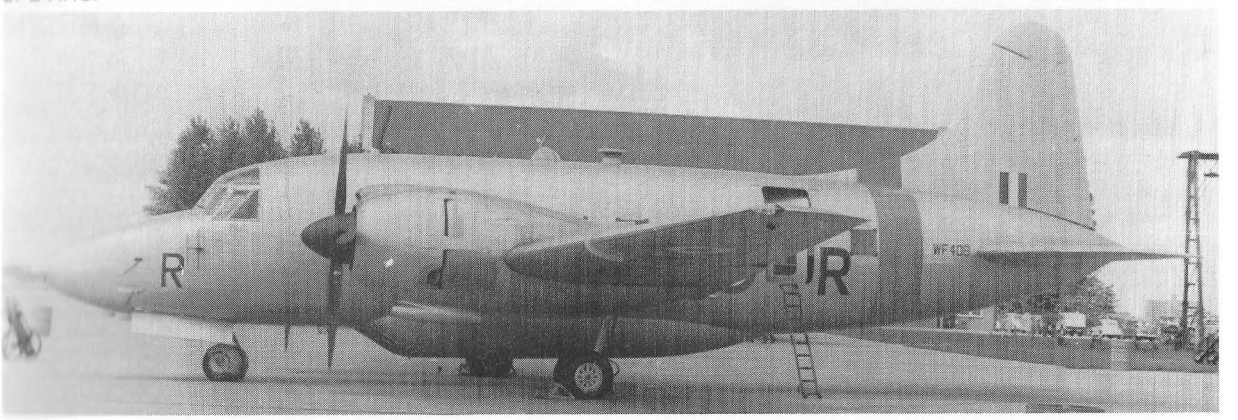
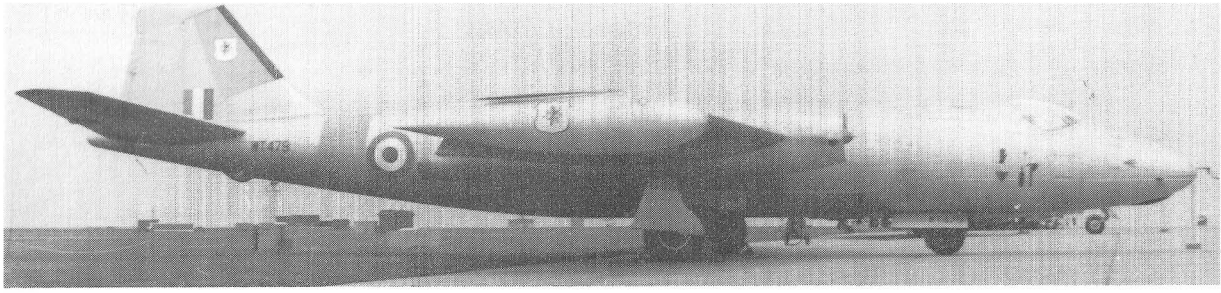


Photo 4 *(right) Balliol T 2 of 7 FTS.* **Photo 5** *(below) Varsity of 2 ANS.*





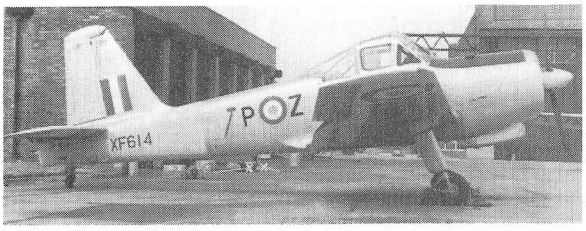


Photo 6 *(above) Canberra T 4 of Upwood Station Flight.*
Photo 7 *(left) Provost T 1 of CFS.*

vice and the two-letter individual identity remained in use. The precise style of dayglo application varied between units. Aircraft in service in small numbers were destined to wear personalised schemes for years, particularly such types as Auster T 7s and Ansons used by Training Command. Photo 7 showing Provost T 1 XF614 P:Z of the Central Flying School was taken on July 25 1959, at Waddington. It illustrates a typical marking style for that type of aircraft, a few weeks after dayglo was introduced. The cowling carries dayglo orange, as do the wing tips, an area beneath the wings ahead of control surfaces, the rear fuselage and a chordwise band across the tailplane. Later, some entire tailplanes were dayglo although rarely were control surfaces painted for fear of upsetting control balance.

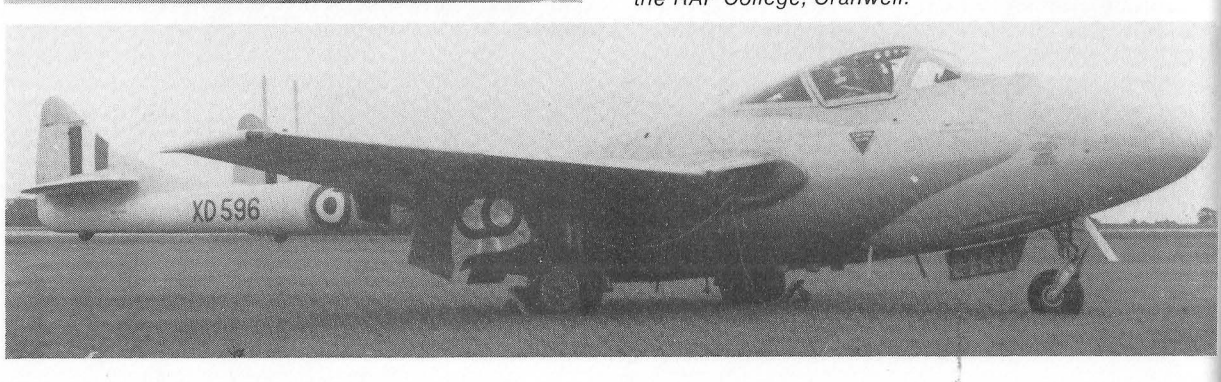
Photo 8 depicts one of the variations in training markings. In 1955 the Royal Air Force College, Cranwell, introduced a very personalised marking,

a light blue band edged dark blue around the rear fuselage and sometimes carrying the college badge. Wing bands remained yellow before dayglo trim in the style of XF614 was applied as here. Letters and serials remained black.

June 1960 presented a good opportunity to witness the current stages of trainer markings, when the Parade of the Queen's Colour for the RAF in the United Kingdom took place at Oakington. At that time 5 FTS was flying mainly Vampire T 11s as advanced trainers for those pilots initially trained on Provosts. The Vampires, typified by XD596 (Photo 9) were in high-speed silver with orange dayglo areas to noses, rear booms, fins and wing tips. For a considerable time they bore little by way of individual identity, but later adopted large black nose letters, eg, AS, AZ, etc. As stable mates they had a few Meteor T 7s (Photo 10) introduced to accommodate long-legged pilots. These reliable but ageing Meteor T 7s had progressed through the four-letter, two-letter and a letter-number process, but were now often seen shorn of identity save, sometimes, a Flight colour on the nosewheel door. WG987 revealed the way in which, as ever, an unusual marking can despoil an ordered system — its fuselage serials were dark blue!

The extent to which training units could trim their markings was indicated at this time by Provost T 1 XF888 M:K which served for ten years at 6 FTS Tern

Photo 8 *(left) Provost of the RAF College, Cranwell.* **Photo 9** *(below) Vampire of 5 FTS.* **Photo 12** *(right) Jet Provost of the RAF College, Cranwell.*



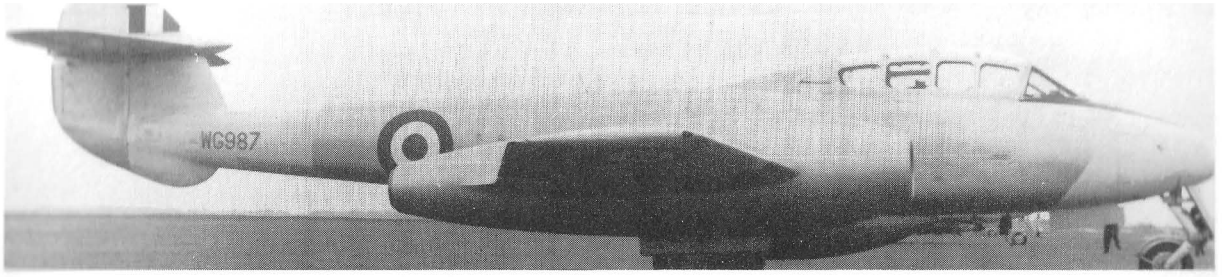
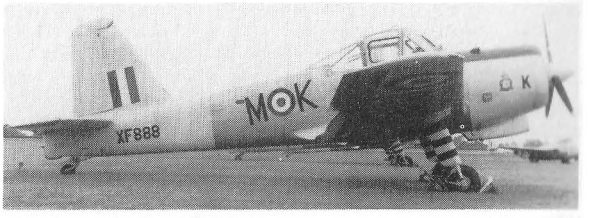


Photo 10 *(above) Meteor T 7 of 5 FTS.* **Photo 11** *(right) Provost T 1 of 6 FTS.*



Hill (Photo 11) and which featured the unit's badge on the cowling and black/white undercarriage struts for Flight identity. Its spinner and fin were dayglo, whilst the tailplane retained just the band.

By 1961 the Jet Provost (Photo 12) was available in some numbers, silver with orange dayglo on nose, rear fuselage, fin, wing tips and on the tempting wing tip tanks. A new feature which then came into use on these machines was the number identity in place of letters, evidenced here by '51' of the Royal Air Force College whose blue band encircles the rear fuselage supplemented on the nose by the unit badge. Again, positioning of the black numbers aided identity of units. XN583 was photographed in September 1961 at a time when trainers were flying bearing areas of deep red dayglo in place of orange.

Already a revised presentation of dayglo was in evidence for 'strip dayglo' had appeared: strips of dayglo red applied (Sellotape fashion) to noses, wings and wing leading edges, tails, tip tanks and, indeed, seemingly wherever else possible. This produced a flux of chaotic markings.

Varsities had adopted orange dayglo trim in the form of wing tips, fin and nose, and often a thin dayglo line (usually trimmed black) joined nose and tail markings producing the first trainer cheat line. In the case of WJ896 (Photo 13), which had the customary Varsity fin letter in black, the spinners were the silver colour featured by aircraft of the Air Electronics School, Hullavington. That unit's badge is visible on the nose in this photograph taken in September 1961.

A new paint scheme soon appeared on Varsities whose fuselage lower half, entire wings and tailplanes and engine nacelles were painted Light Aircraft Grey, leaving the top of the fuselage, fin and fin fillet to be painted white. A host of narrow red dayglo strips was applied on to the nose and fin (Photo 14). The black fin letter was retained and spinners were usually black. The effort of cutting and applying dayglo strips must have been tedious, to say the least. It was rumoured at this time that it

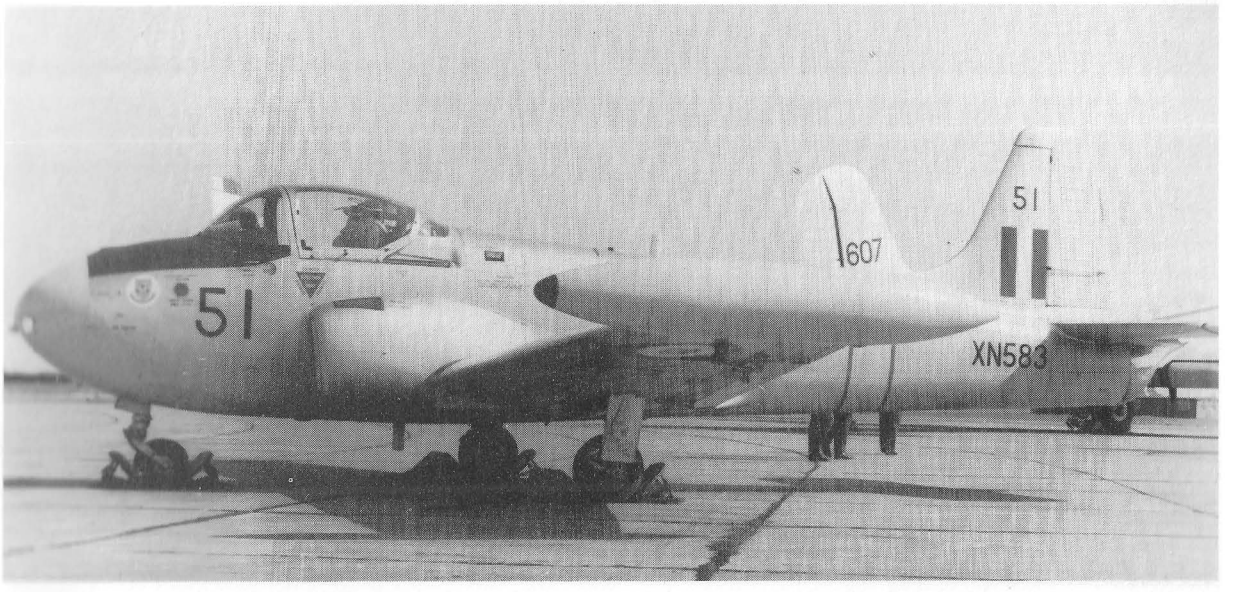


Photo 13 *(top) Varsity of the AES.* **Photo 14** *(below) Varsity showing dayglo strips.* **Photo 15** *(bottom) Varsities of 5 FTS. Facing page:* **Photo 16** *(top) Jetstream of 5 FTS.* **Photo 17** *(bottom) Gazelle in the current scheme.*

had been introduced because there was some concern that the luminous paint used hitherto might be mildly radioactive and might, at least, affect structures. The Americans, who had also taken to dayglo, very quickly shed it amidst some talk by pilots that, far from reducing flying accidents, dayglo seemed to have an almost hypnotic effect.

Grey under surfaces of Varsities led to the current bright schemes. Grey and white areas were thereby separated by a broad Post Office Red line, fins and fillets painted red and spinners likewise. Grey letters were applied to fins as can be seen in Photo 15 which shows Varsities of 5 FTS which were being used for twin conversion flying training in 1974. This new, brilliant scheme first appeared on Gnats at 4 FTS Valley, and all the Dominies wore it from the start, as would all trainers in future (although repainting took years to complete).

This scheme was also featured by the Jetstreams of 5 FTS, which had a very short lifespan. XX483 (Photo 16) pictured in the 1975 autumn sun at Oakington, typifies the current state of markings whereby identity is white on the fin. Such lettering is often repeated on the nose, spinners are black and fuselage roundels have a white surround.

In 1975 propeller tips were changed to red and white as a further safety measure, and the summer of 1977 saw further revisions of this feature to cover entire front propeller blade faces, leaving the rear black or silver with yellow tips to reduce pilot distraction.

Without doubt the present Post Office Red/Light Aircraft Grey/white scheme with black anti-dazzle areas is the smartest ever worn by RAF trainers, as surely illustrated by the Gazelle (Photo 17) used for helicopter training.

The aim where trainers are concerned has always been to make them easily visible in flight. During the last war efforts were at all times similarly directed whilst at the same time trying to avoid making the aircraft too easily visible when on the ground. Variations in trainer markings abound as with any aircraft type so that, given time, patience and a goodly supply of painting skill, RAF trainer markings would make an excellent theme for model presentation. Time to get busy! □

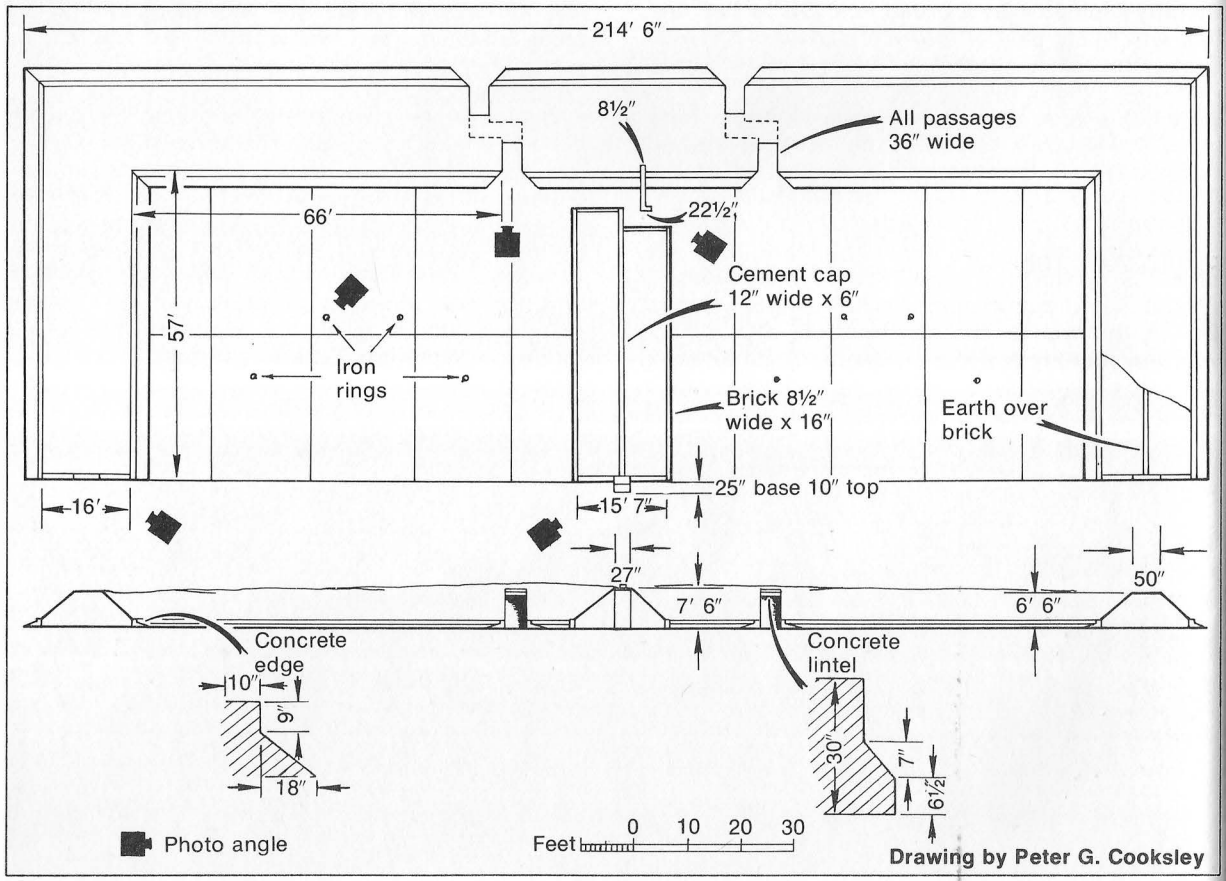
BATTLE OF BRITAIN FIGHTER DISPERSAL

Peter G. Cooksley illustrates a simple but effective wartime diorama base for model aircraft

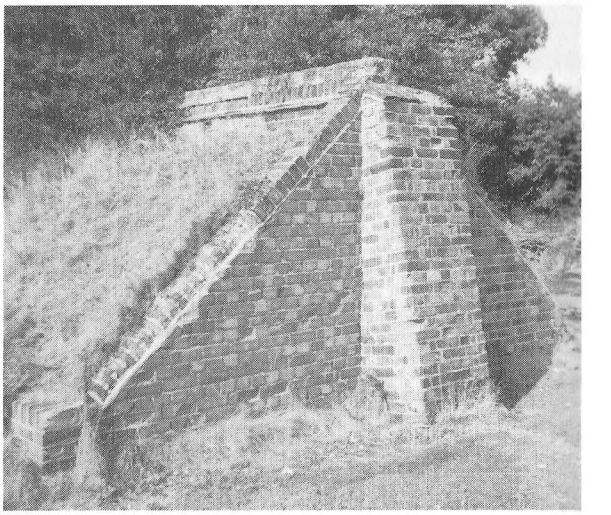
For model builders who are looking for a new setting for the display of their model fighters these photographs and drawings of a fighter dispersal pen have been specially prepared from a surviving example.

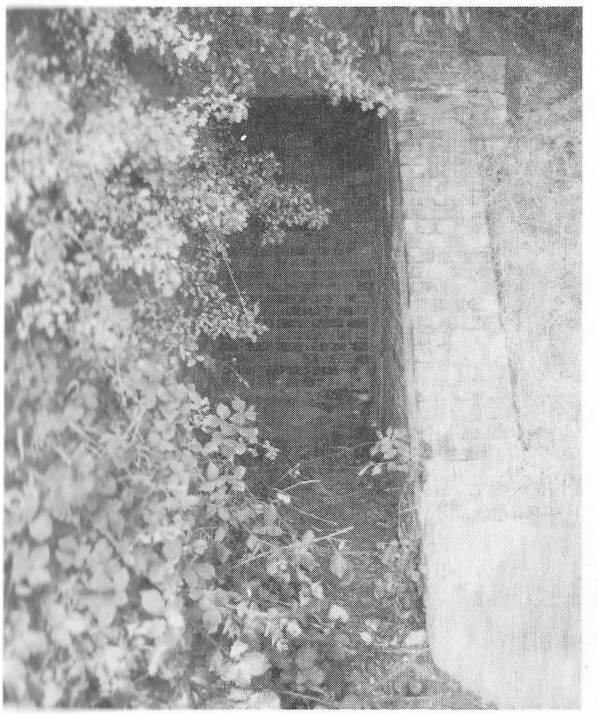
The basic idea of these pens was to protect fighters at dispersal and the attendant ground crews from enemy low level attacks and consisted of an 'E'-shaped brick structure often covered with earth. It is worth noting that the shape and areas of the concrete sections which formed the floor of the pens, although always the same in an adjacent bay, varied from pen to pen, often on the same station. End walls were 8½ inches thick, the height of the middle partition being 12 inches taller than the ends, with an additional 6 inch slab of cement running the length of the centre wall above the earth covering. Note also that a double row of tiles is set below the top row of bricks on the end walls while the short, central, rear wall has bricks here.

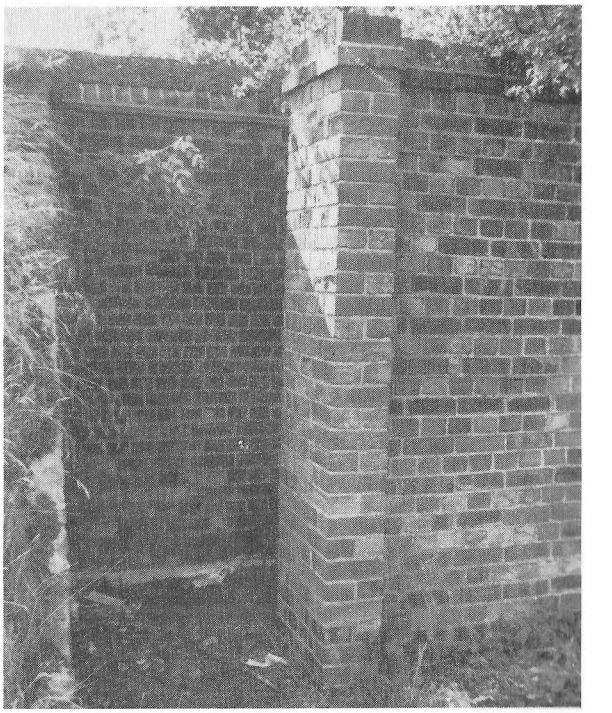
There were several types of dispersal pen; *The Hawker Hurricane* by F. K. Mason shows a variant at Wittering with earth covering only on the outer walls which are of different design, while a diorama in the RAF Museum at Hendon shows one similar to that here described but incorporating a species of surface shelter. A photograph of a pen somewhat similar to that shown in the drawing may be found



Above left *One of the two outer end walls showing how the tiles are set under the final row of bricks and, just visible on the right, the low cement wall to retain the earth covering. Main wall is about 12½" thick.* **Above right** *An iron picketing ring set in the concrete base; these are 3/16" thick with an outside diameter of 3½" and are held by a 1 3/16" eye.* **Right** *The end of the central division, thinner than those at the end being only one brick, 8½" thick. Note the 16" high earth-retaining wall and the tiles which cap the 10" top to the sloping buttress.* **Below left** *One of the angled passages through the back covering. Note the concrete lintel. The brickwork to the right of the wall, which is some 12½" thick, would originally have been covered by earth.* **Below right** *Exit from the rear passage behind the central division; the 8½" thick, short wall has a line of brick at the top while the concrete slab on the main wall, which has a double row of tiles below the top layer of brick, is just visible.*







A general view of a dispersal pen today with author's wife (holding author's shirt) to give scale. It should be remembered that the bushes and undergrowth would have been absent during the wartime use of these pens. NB, Small dimensions may be arrived at with the aid of the photographs remembering that a brick measures 8½" x 4" x 2½" and allowing about ⅜" for the mortar between.

in Purnell's *History of the Second World War.* This was taken on Sunday, August 18 1940 at Kenley, Surrey and shows a Spitfire of No 66 Squadron in a dispersal pen under low level attack by a Dornier 17Z.

The model

Although model builders will have their own way of simulating brick a simple method is to cover the parts with printed brick paper as used by 00 Gauge railway modellers. The end walls can be easily cut from thick card and the buttress for the central one built up or cut from polystyrene. Hardboard makes an excellent base and this should be covered with a thin layer of mixed grey powder colour and Polyfilla applied fairly stiff and levelled by means of a gentle chopping motion with the side of a lolly stick to obtain the correct, slightly ridged surface. Dividing lines between the areas would be a mid- to dark grey shade.

Earth covering can be built up with polystyrene scrap and covered with paste-soaked newspaper before being allowed to dry out thoroughly and covered with glue. On to this is sprinkled 'grass' obtainable from model railway suppliers. Alternatively this may be produced by a mixture of sieved sawdust and green powder colour, it being best to prepare several shades and an earth brown to represent bare patches. □

BOMBER COMMAND NOSE ART

Bryan Philpott shows that the USAAF was not alone in adorning its bombers

Mention nose art and most peoples' thoughts turn immediately to the scantily clad female forms which were to be seen adorning B-17s and B-24s of the USAAF. Although this is an understandable association of ideas, since a great deal of publicity was, and still is, given to this apparently American dominated area, a little research will quickly reveal that our 'cousins' did not by any means have it all their own way.

It is probably true to say that nose art, in its many forms, was common to many aircraft of the USAAF and not just to the two types already mentioned. But other air forces, including the RAF, certainly produced more such artwork than is usually associated with their aircraft. This is particularly so in the case of RAF Bomber Command whose soberly camouflaged night bombers are usually depicted with nothing more than a somewhat dignified scoreboard of operations on their nose areas.

In any short appraisal of something which is considered to be far from the 'norm', generalisation can be a dangerous weapon. In the space available such a weapon must be used, but I have tried to be ultra careful, while at the same time presenting carefully considered conclusions. I do not for one moment consider this article to be in any way, shape, or form a definitive one, but merely a presentation of facts as well as calculated guesses, all of which are aimed at the modeller who might wish to find some attractive adornment for his latest Bomber Command model. With this in mind most

Top of page *A wolf on skis and various 'dagger' mission markings decorate the nose of this Stirling of 570 Squadron* (T. Harrison via R. L. Ward). **Right** *Halifax BII Series 1a MH-T:HR946 of No 51 Squadron. The captain is Pilot Officer T. Bishop, hence 'Bishop's Bashers'. Markings are all white* (via J. L. Boulter).

of the schemes presented in John Tasker's colour drawings are available from the specialist decal (transfer) manufacturers, and those which are not should be within the skill of most modellers who are practised in the deft use of a small paint brush.

Any form of artwork, apart from national markings, code letters, serials, etc, was strictly unofficial, and although in most cases officialdom turned a 'blind-eye' to the efforts of the squadron artist who chose the nose of a bomber for his canvas, there are many cases where this was actively discouraged.

During interviews with many ex-Bomber Command aircrew, several of them quoted cases where on certain squadrons the commanding officers had made it quite clear that they would not tolerate any form of decoration being applied to aircraft. This does become rather apparent when studying some of the works covering the Command's activities where photographs of aircraft are used extensively. Time and time again it is possible to find photographs of aircraft belonging to certain squadrons which are painted strictly in accordance with the 'book'. I am not suggesting for one moment that in all such cases any form of decoration was forbidden, but there is strong evidence to suggest that in a lot of cases this was true.

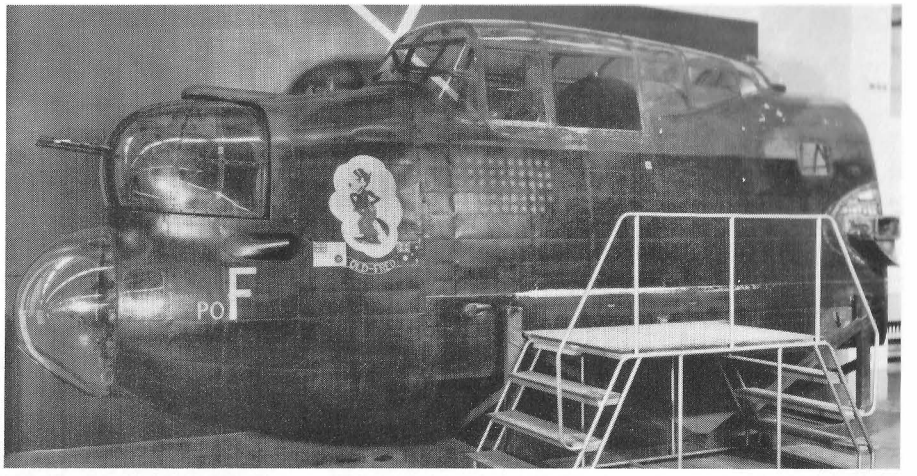
No doubt the female form in its multitude of attractive poses was just as pleasurable to RAF crews as it was to those serving in the USAAF, but the fact that it does not appear on Wellingtons, Lancasters and Halifaxes to the same degree as it did on the B-17, B-24 and B-26, probably indicates the Englishman's natural reserve rather than anything more sinister. Another aspect is that much of the artwork found on British bombers did in fact tend to take a humorous swipe at the crew concerned, or the enemy — another trait of the English race.

However, the female form was by no means totally excluded and one favourite subject was the Daily Mirror's famous strip cartoon character *Jane.* Examples of this shapely maiden appear on a Halifax B III of No 462 Squadron where she is to be found reclining on a blanket, a Lancaster B III (ND340) code GT-J of No 156 Squadron where the artist has chosen a more militant mood and shows her tearing up a swastika, and on another Lancaster B III (JB138) QR-F of No 61 Squadron where she sits astride a bomb. Similarly, 'Vicky the Vicious Virgin' and 'Dante's Daughter', a Halifax B VII and Lancaster B I respectively, also use the pin-up to great advantage. In the case of 'Dante's Daughter', the figure is merely an outline and must be considered to be poorly drawn when compared with 'Vicky' or others, especially those most usually shown as good examples of USAAF artwork. The reason for this is that all such artwork was applied by whoever was considered to have a certain amount of artistic skill.

In some cases this might well have been a fully trained commercial artist, or even a good amateur who happened to be serving on the squadron, when the results would be excellent. In others it might be a crew member who was detailed by the skipper to paint some suitable decoration simply because he happened to have been a painter and decorator in civvy street! This example may be an over simplification but it makes the point that there are artists and artists. Naturally Walt Disney characters were very popular since Goofy, Mickey Mouse, Donald Duck, and Popeye were just as much a part of life in those days as Tom and Jerry and Bugs Bunny are today.

With most of the four-engined 'heavies' carrying

Below left *Extravagant nose art on Lancaster B1 WS-J:W4964 of No 9 Squadron* (via R. L. Ward). **Below right** *Typical bomb symbols on the nose of another No 9 Squadron Lancaster B1 photographed by Lewis Brown at Waddington in December 1942* (via R. L. Ward).



Cockpit section of a Lancaster B1 in the Imperial War Museum. It is not known if the nose art is authentic, but it is typical of the period (IWM).

a crew of seven, Snow White and the Seven Dwarfs was a natural subject, so it is not surprising that Grumpy, Doc, Dopey and their four colleagues appeared on Lancaster B III (PB480) TC-G2 of No 170 Squadron, while Mickey Mouse towing a trolley carrying a bomb adorned Lancaster B III (EE176) QR-M of No 61 Squadron.

Donald Duck was chosen by No 105 Squadron to decorate Mosquito B IV (DZ548) and another of the squadron's aircraft used Goofy. It is likely that other Disney characters were used by No 105 Squadron since both the examples quoted were used in conjunction with a badge showing the four playing suits from a pack of cards. It is known that one other Mosquito using this badge also had a traditional RAF Gremlin supporting it. The colour illustration of the aircraft carrying Donald Duck is based on the memory of an ex-ground crew member, so cannot be claimed to be 100 per cent accurate.

On the subject of colours used in painting nose art and other forms of decoration, it is very difficult to be dogmatic. A lot are based on conjecture and unless one can find authentic colour illustrations or other forms of proof, the correct colour must be left to guesswork or logical detective work. A good example comes from one pilot who assured me that the artwork on his aircraft was definitely painted with a blue background, but when pressed further as to the shade of blue it turned out to be a turquoise colour which another crew member had previously recorded as being green! Similarly, colours used to record operational scoreboards must also be open to some doubt. Over the years it has generally been accepted that the majority of miniature bombs used to record trips were painted red for night ops and yellow for day ops. While this may well be correct there were many exceptions, and these apply not only to colours but also to the shape of the symbols used. On Halifax B II Series 1A (HR946) MH-T of No 51 Squadron both the name and symbols were painted in white. On some aircraft of No 425 Squadron ops tallies were indicated by beer mugs for night raids and beer bottles for daylight raids, while it was not unusual to see other forms such as musical notes on Lancaster B III (PB532) of No 100 Squadron and, for some obscure reason, miniature cheeses on a Lancaster of No 463 Squadron. Bomb symbols were, however, the most commonly used ops tally and usually adopted the simple shape associated with a bomb, but once again there are a considerable number of variants.

The individual aircraft code letter quite often formed the basis of nose art; L for Love, a Lancaster B I (ME515) of No 218 Squadron, was christened 'Lovely Lou', both words starting with the code letter, and Q for Queenie had many variations on the squadrons, the best known being Lancaster B II (DS708) of No 408 Squadron which had a large Queen of Spades playing card painted on its nose. Mythical dragons, Greek and Roman Gods, symbols of the occult and famous characters from books also found their way on to a variety of bomber aircraft. Possibly the most famous book character was Leslie Charteris's Saint. The spindly matchstick symbol with a halo was simple to paint and adapt to a variety of situations. The Saint can be found on a Wellington of an unknown unit where it is shown dropping a bomb, and on a No 617 Squadron Lancaster B III (Special) (ED912) AJ-S piloted by Flight Lieutenant Kearns, where it has sprouted wings, carries a bomb beneath the left arm and has the legend ITMA (It's That Man Again from the famous radio show) under its left leg. The Saint also appears again beside the bomb symbols of a Lancaster of No 460 Squadron in cases where the particular operation was flown by Flying Officer Saint-Smith.

Some nose art appeared on aircraft of different squadrons, either as an indication of minds working on similar lines or perhaps even a crew member being posted to another squadron and taking his favourite marking with him. One such case is the Jolly Roger flag painted on a Stirling of No 199 Squadron, illustrated in *Profile No 142,* which can also be found on Fairey Battle MQ-R of No 226 Squadron operating in France in 1940.

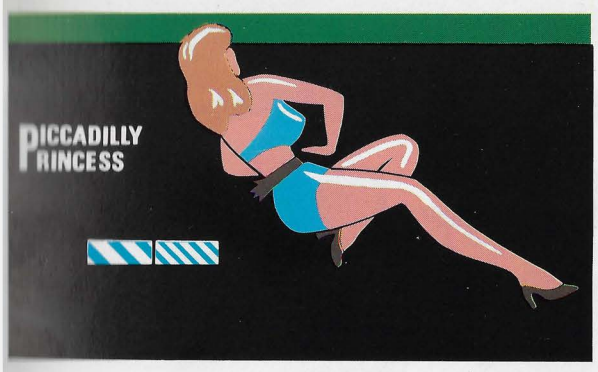
Names such as 'Hellzapoppin' on a Lancaster

and 'Hell's a poppin' on a Ventura, indicate a similar train of thought, while Y for Youngers and S for Simmonds, which appeared on Lancasters of different squadrons, seem to show the crews' liking for a particular brand of beer, since both these were famous wartime brewers. Similarly, Lancaster B I (W4964) WS-J also carried a name allied to alcohol, this time Johnny Walker, not necessarily because the crew had a distinct liking for that beverage, but because the aircraft was unofficially adopted by the famous whisky company.

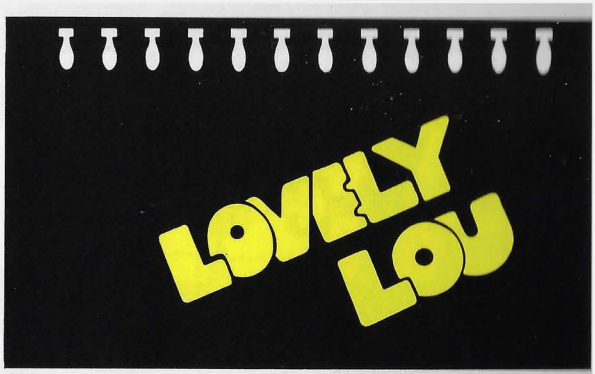
The examples quoted barely scratch the surface of the subject which is one that the longer it is studied and researched seems to indicate that nose art was much more common in Bomber Command than is generally supposed.

Most of the markings illustrated can be found on ESCI decal sheets, but the erstwhile bomber modeller should also obtain sheet M12 in the Letraset-style rub-down transfers (which are marketed under various names), as this provides a multitude of bomb symbols, kill markings, and nose decoration, the latter being not only for bombers but also including some famous RAF fighters which could match some of the colourful Thunderbolts and Mustangs of the USAAF . . . but that's another story. □

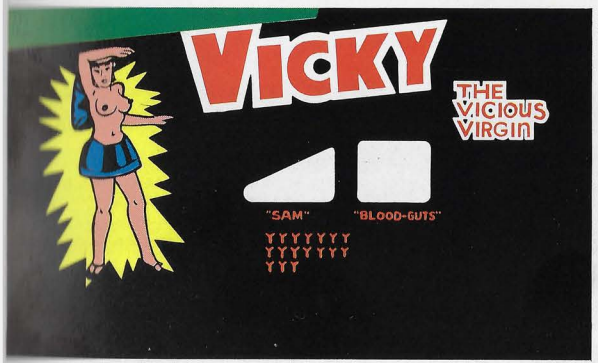
Key to colour plates. 1 *This 'pin-up' is a good example of the style more frequently associated with the USAAF. It appeared on the nose of Lancaster B1 QB-P:NG347 of No 424 (Tiger) Squadron RCAF which operated in No 6 Group. The squadron used Halifaxes, Wellingtons and Lancasters which they received in January 1945. The DFC and DFM medal ribbons refer to decorations received by crew members.* **2** *A common style of nose marking based on the aircraft's individual code letter, in this case Lancaster B1 XH-L:ME515 of No 218 Squadron RAF. In World War 2 'L' in the phonetic alphabet was LOVE, so in this case it is likely the crew based the name on this and chose Lou as a suitable alliteration.* **3** *Another famous example of the use of the female form together with alliteration. Vicky the Vicious Virgin was a Halifax B VII EQ-V:PN230 of No 408 (Goose) Squadron, another 6 Group RCAF unit. Once again the aircraft's code letter has been used as a basis for the nose art. This Halifax also had the crews' nicknames painted in yellow below their positions.* **4** *Possibly the most famous Halifax of them all, 'Friday the 13th'. This aircraft was Halifax B III of No 158 Squadron, serial LV907, codes NP-F. The crew threw superstition to the wind by painting all the symbols which were alleged to bring bad luck, such as an inverted horseshoe, a skull, a scythe and the legend, 'As Ye Sow, So Shall Ye Reap'. The medal ribbons refer to crew decorations except for the ribbon of the Victoria Cross which was unofficially awarded to the aircraft after the war. This Halifax completed 128 ops and was displayed in London after the war.* **5** *Some aircraft carried simplified nose art such as 'Dante's Daughter', Lancaster B 1 ED731 of Nos 103 and 166 Squadrons (with the former it was coded PM-T and with the latter AS-T²). The extent of detail often depended on the skill of the artist concerned, in some cases squadrons had many talented artists who could accomplish extremely good work, in others it was a case of the simpler the better. Obviously personal preference had an influence, maybe the crew of ED731 simply preferred just an outline.* **6** *Aircrew are noted for taking a sly dig at authority and themselves. This rather ornate nose art decorated Wellington 1c LF-O:T2508 of No 37 Squadron in the Middle East. The items comprising this crest appear to refer to the nicknames or habits of crew members, the winged lemon is aimed at the skipper, Flight Lieutenant Lemon, and the cheese indicates his nickname 'Cheese'. The Haggis obviously pointed at a Scottish crew member, and the other symbols including a female, a feather and what appears to be some dogs, are perhaps best left to the imagination. The legend is best not translated in a publication of this type!* **7** *Lancaster B III QR-J:JB138 of No 61 Squadron carried one of the many interpretations of the* Daily Mirror's *famous strip cartoon character 'Jane'. The swastika above the ops tally indicates a claim by the Lancaster's gunners and was a not uncommon marking. This aircraft went on to complete 123 operations.* **8** *Ned Kelly, the famous Australian robber, inspired the nose art of Halifax B III HD-E:NR152 which, not surprisingly, belonged to No 466 Squadron RAAF. The '+8¼' refers to the engine boost allowed for take-off* **(Paintings by John Tasker).**


PICCADILLY
PRINCESS

1


LOVELY
LOU

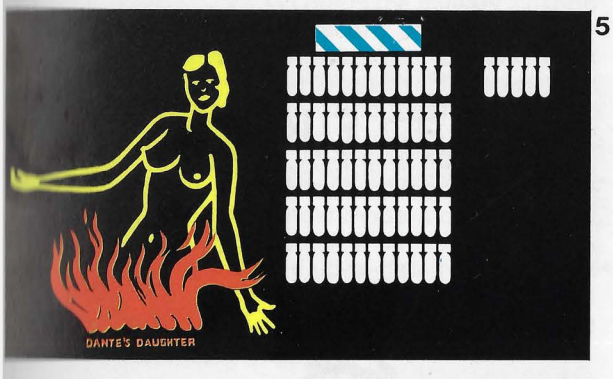
2


VICKY
THE
VICIOUS
VIRGIN
"SAM"
"BLOOD-GUTS"

3

FRIDAY THE 13TH VC
As ye Sow
So shall ye Reap

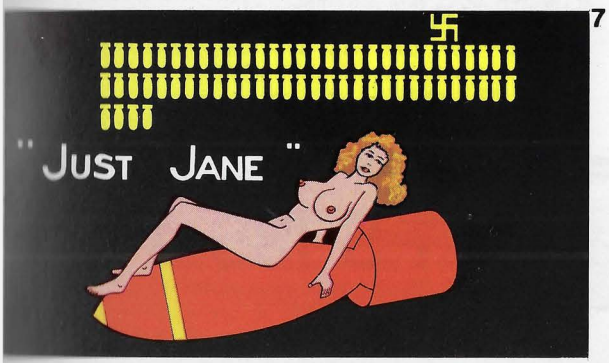
4


DANTE'S DAUGHTER

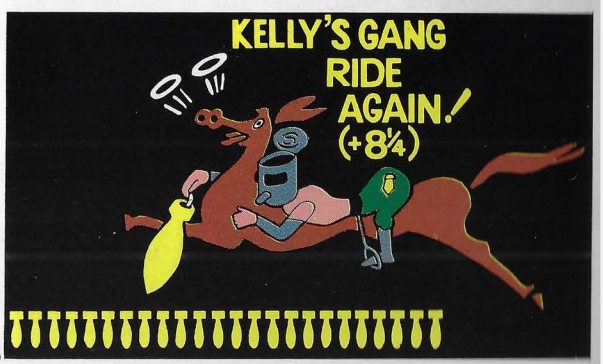
5

DEFAECAMUS LUCES PURPURAS

6


" JUST JANE "

7


KELLY'S GANG
RIDE
AGAIN!
(+8¼)

8

1A
1B
U.S. AIR FORCE
485151
FT-151
Odd Ball
ROSE
1
U.S. AIRFORCE
511382
FF-382
Lil' Warrior II
2
Miss Tena
FU-877
3
5
4A
4B
4C
U.S. AIR FORCE
01139
S-139-A
4

USAF COMBAT MARKINGS: KOREA

Jerry Scutts takes a brief look at the colourful markings of aircraft in this neglected period

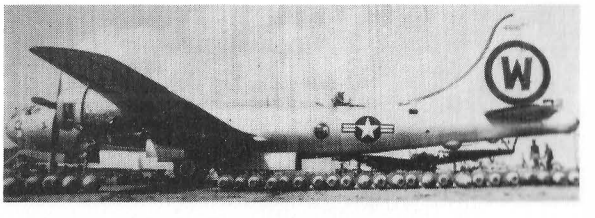
A conflict dominated by airpower, the Korean war of June 1950 to July 1953 offers the military aviation student and modeller a record of operations by three generations of aircraft types. Sterling work was undertaken by designs which had made their mark in World War 2, including the Superfortress, Mustang, Corsair and Firefly, backed by the first operational jet fighters, the F-80 Shooting Star, F-84 Thunderjet and Meteor, which were in turn supported by the then most modern of interceptor fighters, the F-86 Sabre. On a par with the Sabre was the MiG-15, the only up-to-date type among a miscellany of Russian World War 2 aircraft and their derivatives operated by the North Korean/Chinese forces.

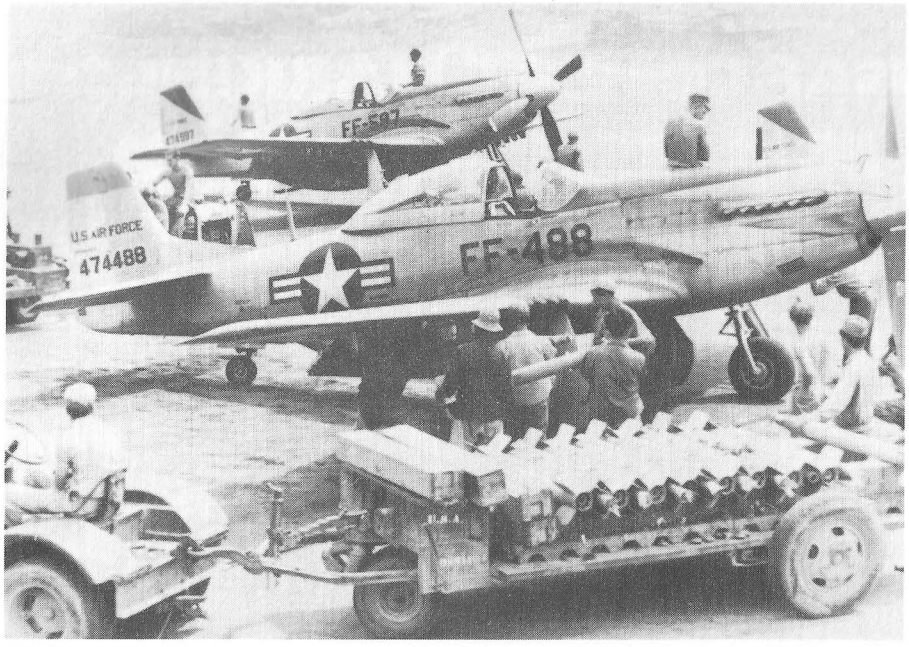
Whilst much has been written about the combat operations of the air forces engaged in Korea, little information is available on the markings and colour schemes employed by the aircraft themselves and this article attempts to record at least some of those used by selected USAF types.

In 1950, the only major changes in American military aircraft markings since World War 2, apart from the national insignia, were the branch of service lettering applied so that it could be read from a considerable distance, and a high-visibility 'buzz number' — two initial letters indicating the type and model number, followed by the last three digits of the serial number. Where serial numbers of aircraft of the same type duplicated, a single suffix letter

Key to colour plates. 1 *Lockheed F-80A-10-LO, 44-85151, 26th FIS, 51st FIW Yontan, Okinawa, May 1950. Aircraft is shown just after transfer to the 16th Squadron but prior to repainting in new colours.* **1A** *Nose flash, 49th FBW F-80.* **1B** *Tail stripe, 7th FBS, 49th Wing.* **2** *North American F-51D-NT, 45-11382 of the 67th FS, 18th FBW, Wonju, Korea, September 1952.* **3** *North American F-86F-30-NA, 52-4877, 8th FBW. Aircraft flown by Colonel W. B. Wilmot.* **4** *Republic F-84E, 50-1139, 111th FBS, 136th FBW, Taegu, Korea, early 1952. Aircraft flown by Douglas E. Whatley.* **4A** *Port side marking of FS-139-A.* **4B** *Leaping wolf marking on starboard side of FS-139-A; this marking was only carried for the machine's later service in Korea, possibly by another pilot.* **4C** *Insignia of 111th FBS.* **5** *Tail marking, 428th FS, 474th Wing.* **6** *Tail marking, 196th FBS, 49th Wing* **(Drawings by author).**

Top of page *Trio of B-29s of the 98th Bomb Wing rolls out for take-off in May 1953* (USAF). **Below** *B-29 of the 22nd Bomb Wing awaiting its load. Carrying the last four digits of the serial number 44-61617 on its fin tip, '1617' is painted on the nosewheel doors and a barely visible squadron colour decorates the fin/rudder tip* (R. L. Ward/E. Munday).





F-51 Mustangs of the 18th FBW receiving their loads of HVARs and .5 cal ammunition for another mission in July 1951. The nearest machine exhibits markings common to Mustangs in Korea, as mentioned in the text, and that in the background is from the 67th FBS, with the tail of a second 67th Squadron machine on the right. Both visible airscrews are of the 'paddle blade' type (USAF).

was added. Natural metal finish (NMF) was standard for the majority of USAF aircraft operated in Korea, except night fighters. In general, each type began flying combat missions in whatever basic finish it happened to have when the call to action came, with local adaptations being made as necessary and when time permitted. Unit badges were widely applied while names and 'nose art', along with a record of missions flown and victories achieved, were as popular as they had been in the last war.

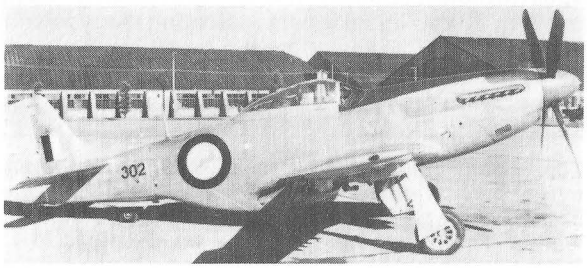
United Nations air operations came under the administrative control of Far East Air Forces, the operational command being 5th Air Force. To avoid confusion, all units mentioned here are referred to as 'wings' rather than 'groups', although prior to 1952 the latter term was still in use. From 1948, new wings added to the USAF inventory were usually activated with a single group, which carried the same numerical designation as the wing.

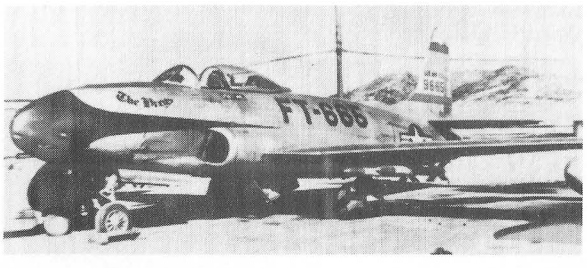
A description of the known markings of the principal fighter, attack and bomber types operated by the USAF follows. The reader should not assume however, that only the units mentioned operated a given type; there were many specialised formations of varying size operational during the conflict and far more space than is available here would be needed to cover them all. After the designation of each type appear the prefix letters of the buzz number allotted to identify that type.

F-51 Mustang (FF-/RF-)

The following units flew a mixture of F-51D, F-51K and F-6 Mustangs in Korea: the 8th, 18th and 49th Fighter Bomber Wings, 35th Fighter Interceptor Wing and 67th Tactical Reconnaissance Wing, USAF; No 77 Squadron RAAF, No 2 Squadron SAAF and the first operational fighter-bomber wing of the Republic of Korea Air Force.

Approximately half the Mustangs available to the USAF were assigned to Air National Guard units on





Above left *Pictured in December 1950, this freshly painted F-51D of No 2 Squadron bears typical SAAF markings of the Korean theatre, including the Flying Cheetah badge* (USAF). **Below left** *F-80C 49-665 of the 16th FIS at Kimpo, late 1950. This machine was flown by the leader of the flight which clashed with MiG-15s on November 8. Flying F-80C 49-713, Lieutenant Russell F. Brown shot down the first of the Russian jets to fall in Korea. Named 'The Dregs', '665 is armed with 5-inch HVARs and carries five rows of mission markers* (USAF Museum/R. Warren).

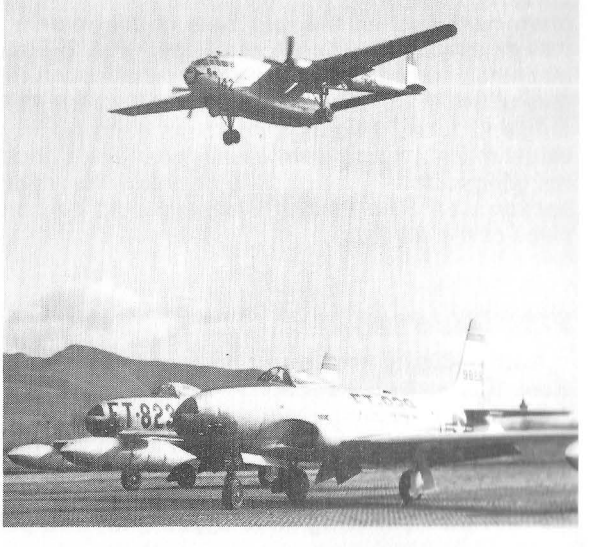
A quartet of F-80s of the 36th FBS, 8th FBW, pictured during a close support strike in September 1951. Two machines bear thin black outlines to their red tail flashes, while 49-491 has yet to have its stripes applied. The fin tip fairing of the F-80 enclosing the antenna of the ARC-3 radio equipment was rarely overpainted, and was light grey in colour (USAF).

the outbreak of war and many machines continued to use the identification markings applied by these Stateside squadrons. Guard Mustangs commonly used red trim on wingtips, occasionally spinners, and the upper section of the fin/rudder above the lower rudder hinge line. One, two or three coloured diagonal bands to identify flight, squadron and wing commanders appeared on the rear fuselages of individual machines, such markings being of both ANG and USAF origin.

All known Mustangs in Korea were in NMF, the buzz number being applied, almost without exception, forward of the national insignia on both sides of the fuselage, although the size of the letters and digits varied between aircraft. Anti-glare panels were either black or olive drab and the practice of painting the canopy bar a distinctive colour, and extending this shade back in a tapering line to the fin fillet, was not uncommon. A wide variety of spinner colours was seen on F-51s, including a horizontal division of two different shades. The 12th FBS (18th Wing) flew Mustangs painted with a distinctive sharkmouth and the 67th Squadron of the wing was one of the most consistent in the application of unit markings, as shown in the drawings. F-6s of the 67th TacRecon Wing's 45th TRS carried the unit's black with white polka dots marking on spinner and wingtips.

Mustangs of the two Commonwealth squadrons were more uniform in their markings, SAAF machines having the blue roundel/orange spring-bok insignia in six positions, fin flashes and three-digit black serial numbers in the 300 range on the rear fuselage. These numbers were repeated on the mainwheel undercarriage doors and spinners were in flight colours. The majority of F-51s also bore the yellow or blue-winged 'Flying Cheetah' badge of No 2 Squadron forward of the windscreen.

No 77 Squadron's aircraft were identified by the



Early 49th Wing markings shown on a pair of F-80s taxiing under a landing C-119 of the 315th Combat Cargo Wing, May 2 1951. The horizontal tail stripes on the Shooting Stars are probably red, indicating the 8th FBS (USAF).

Bomb-laden Thunderjets of the 49th FBW head north for a strike on Communist targets. Extra tip tank markings are visible on two machines and all but one have suffix letters to their buzz numbers (USAF).

serial prefix A68- followed by three digits, with red, white and blue roundels and fin flashes. Most squadron aircraft had spinners with single bands of red, white and blue reading from the tip, although commanders' machines had the spinner in one of these shades, and rank pennants adjacent to the cockpit.

Each ROKAF Mustang carried the letter 'K' across the fin/rudder, taking up most of the area above the tailplane, but in varying styles. Black was the most common shade for the letter, but blue was also used. Flight distinctions were made by a single coloured band aft of the fuselage national insignia, often hard against the rear bars of the marking. Wingtips were often coloured and one or two machines had a fin/rudder tip colour, although the tails of South Korean aircraft usually bore only the single ID letter. Two-digit numbers identified individual machines and were usually positioned under the windscreen, forward of it, or below the 'open' section when the canopy was slid back, on both sides of the fuselage.

F-80 Shooting Star (FT-)

NMF F-80s of the 51st FIW were identified by nose flashes in the squadron colour — dark blue for the 16th, insignia red for the 25th and orange-yellow for the 26th, with a single matching horizontal band running across the base of the fin/rudder and a second band just below the fin tip. However, as with the 49th Wing, blue appears to have predominated for the nose flash, irrespective of squadron.

Some machines did not have the upper band applied, so that some 51st Wing machines could be confused with the 49th Wing, if only the tail was visible. Although designated as an interceptor wing, many F-80 missions for the 51st were of a ground attack nature, so rows of bomb silhouettes were painted on some aircraft. Buzz numbers on F-80s were generally marked on the centre of the fuselage, although early missions were flown by aircraft with these markings on the nose and without the wing flash. Names when applied were usually positioned forward of the windscreen in the 51st Wing, squadron badges being applied forward of the buzz number or above the serial and branch of service lettering on the fin. Such markings were not, however, carried by all aircraft.

A downward-swept nose flash in the squadron colour identified F-80s of the 49th FBW, together with a single horizontal stripe at the top of the fin/rudder, yellow, orange-red and blue identifying the 7th, 8th and 9th Squadrons respectively. Light shades were outlined in black on both nose and tail, command machines having all three colours marked on the fin, each with a thin black outline. Other markings were as for the 51st Wing, although 49th Wing unit badges tended to be marked low on the nose, forward of the air intakes.

During its F-80 operations, the 8th FBW applied three tapering diagonal stripes to the vertical tail surfaces; in sequence medium blue for aircraft of the 35th Squadron, red for the 36th and yellow for the 80th, both red and yellow stripes being outlined in black for greater contrast. Both F-80s and later Sabres of the 8th Wing displayed considerable variation in their tail markings when the stripes were applied, the presentation of the serial number

being the exception in the 80th Squadron although the 36th generally re-applied the serial over the stripes. The latter unit also applied three diagonal stripes to the 'Mizawa' tip tanks used by the squadron and individual aircraft carried diagonal command stripes around the fuselage aft of the wing. Unit badges do not appear to have been applied on 8th Wing Shooting Stars, although nicknames adorned the noses of certain aircraft, the presentation including script and 'old English' style lettering, the wording often running diagonally across the nose.

F-84 Thunderjet (FS-)

The F-84 became FEAF's standard fighter-bomber and equipped five fighter-bomber wings (the 49th, 58th, 116th, 136th and 474th) and one escort wing, the 27th. Only three Thunderjet groups were actively engaged in Korea at any one time, however, as the 136th and 116th were ANG units which were returned to the US less personnel and equipment on July 9 1952, along with their numerical designations, the units in Korea being redesignated the 58th and 474th Wings. In the spring of 1953, the 474th and 49th Wings exchanged designations, the result being that the 116th, 474th and 49th Wings used the same aircraft markings at different periods.

Strategic Air Command's 27th FEW carried out its first Korean strike in December 1950, its aircraft carrying the markings that would be subsequently used by the 136th and 58th Wings — single eight-inch diagonal stripes on the vertical and horizontal tail surfaces, a nose band with a backswept 'V' and an arrowhead stripe on each tip tank, five inches deep. The 27th's squadrons were the 522nd, 523rd and 524th, which are believed to have used the colours red, blue and yellow respectively, the latter shade being outlined in black. The branch of service lettering and serial number bisected the stripe and the colour was either 'lifted' around the letters and numbers or divided to leave a NMF strip. As the 27th Wing aircraft were 'inherited' by the 136th and 58th Wings and new F-84s arrived in Korea, so the single stripe marking was perpetuated until the end of the war. The shades red, yellow and blue are believed to have been used by all three wings, the sequence for the 58th being yellow for the 310th Squadron, red for the 311th and blue for the 69th.

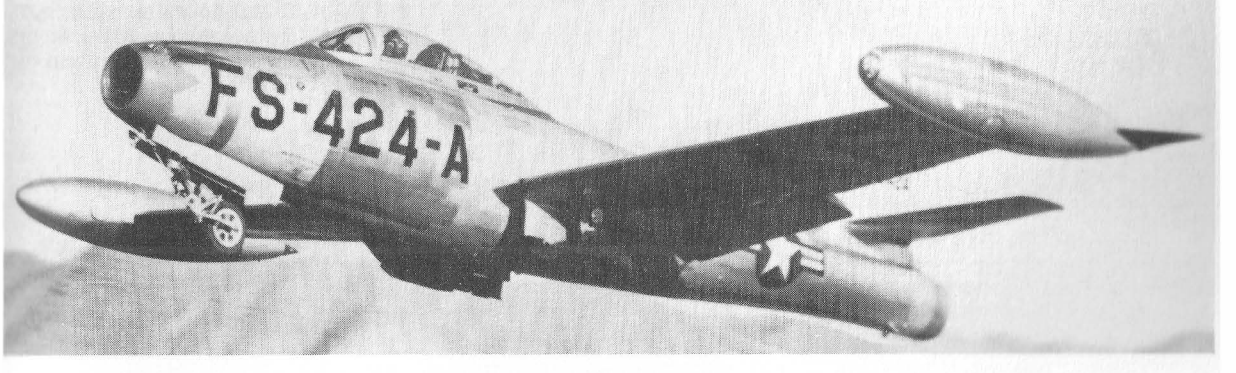
Known as the 'Texas Wing' because nearly 75 per cent of its personnel hailed from the Lone Star State, the 136th Wing comprised two Texas ANG squadrons, the 111th and 182nd, and the 154th from Arkansas. The 111th Squadron's Thunderjets were fairly consistently marked with the unit badge, a yellow star on a blue disc, positioned above the serial and service identification, on the upper part of the diagonal stripe. There is some evidence to suggest that the background to the star marking was painted to match the colour of the stripe already painted on aircraft handed to the squadron.

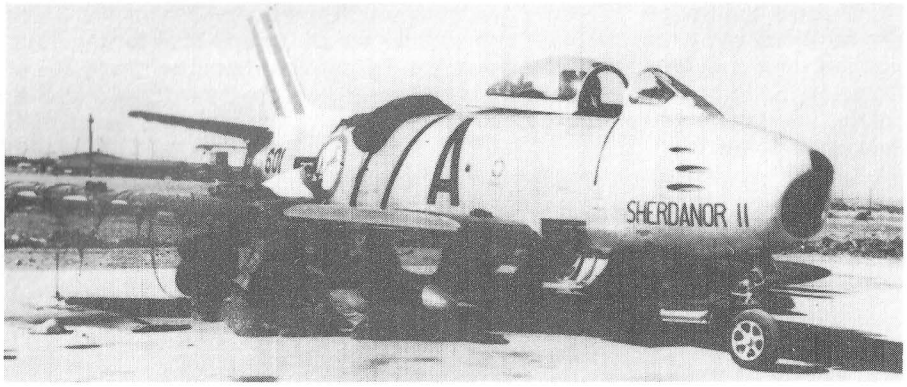
The striking tail markings of the 49th consisted of alternating black and white or yellow chevrons, with a matching coloured nose band. Similar tail decoration was specified for the 474th Wing — white and red chevrons for the 430th FBS, blue and white for the 428th. F-84s of both wings also carried chevrons on each tip tank, three being most common and up to seven for a wing commander's machine.

The 49th Wing changed its markings during the latter part of the war and in common with the 116th and 474th Wings, applied two horizontal stripes to the vertical tail surfaces, a 12-inch stripe around the tailpipe under the horizontal stabiliser, a matching band on the nose intake and coloured fins and stripes on tip tanks to identify the squadrons. The colours were: red, blue and yellow for the 158th, 159th and 196th Squadrons of the 116th Wing and the 428th, 429th and 430th Squadrons of the 474th Wing; and red and blue for the 7th and 8th Squadrons of the 49th Wing.

In common with other types, many F-84s carried nicknames above or aft of the nose buzz number and unit badges adorned some machines. The duplication of serial digits necessitating application of a suffix letter to the buzz number, applied to Thunderjets more than any other type in Korea.

One of SAC's 27th Fighter Escort Wing Thunderjets takes off for a mission in December 1950. A 522nd Squadron machine, it bears red nose and tip tank markings, single diagonal stripes on the tail surfaces, and a buzz number of typical style and location for the type (USAF).





'Sherdanor II' 601/A of No 2 Squadron, South African Air Force (SAAF).

F-86 Sabre (FU-)

The first Sabres in Korea were operated by the 4th FIW, aircraft being marked with three eight-inch black and two white diagonal stripes around the fuselage and chordwise around the wings inboard of the tip, with a single black stripe on the rudder following the hinge line. The extreme tip of the nose was marked in the squadron colour: red for the 334th FIS, white for the 335th and blue for the 336th, although nose decoration was on a random basis. Early 4th Wing Sabres did not generally carry squadron badges, but nicknames were applied to the lower nose, usually in black 'old English' style script.

The 4th Wing was the only Sabre wing in the Korean theatre until October 1951, when the 51st Wing received F-86E models to replace F-80s; these aircraft were marked in accordance with 5th Air Force Regulation 900-1, which introduced the golden-yellow wing, fuselage and (in the case of the 4th Wing) vertical tail surface bands with a black border. The bands were specified as 36 inches wide on wings and tail, and 38 inches on the fuselage, all borders being four inches. These markings were used by all Sabre wings in Korea until the end of the war and for some time afterwards.

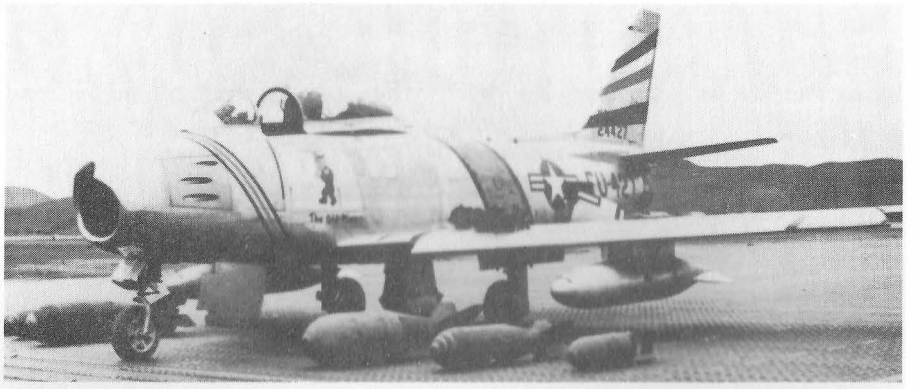
Tail markings for the 51st were 12-inch black squares on NMF in a chequerboard pattern, with a single coloured stripe on top to identify the squadron: blue for the 16th FIS, red for the 25th and yellow for the 39th. When the 8th FBW converted to the F-86 from F-80s in April 1953, its aircraft sported the theatre markings and the three (occasionally four) diagonal tail stripes which had adorned its Shooting Stars. Additionally, flight, wing and squadron commanders' aircraft were identified by the application of three-inch wide coloured stripes placed diagonally on the nose in red, blue or yellow or a combination of all three, and different colours were also used for the tail stripes of these command machines.

The 18th FBW converted to Sabres in February 1953, its aircraft being marked in a similar manner to other wings, with squadron colours painted on the nose ring: yellow for the 12th FBS and red for the 67th FBS, with a two-inch black border. The wing's tail marking was three stripes parallel to the fin leading edge, in red, white and blue. Sabres of No 2 Squadron SAAF, attached to the 18th FBW, had similar markings, those on the tail being in South African national colours. National insignia appeared in six positions, with single black identity letters forward of the fuselage band and three-digit rear fuselage serials. Along with the 'Flying Cheetah' badge, many SAAF Sabres had names on the lower nose, but in Roman rather than old English lettering.

B-29 Superfortress

The 'very heavy' spearhead of the USAAF's Pacific bombing campaign in World War 2, the B-29

B-26B 44-35416 of the 17th BW showing widely used red trim on nose, wings and tail (via F. F. Smith).



An F-86F of the 8th FBW makes an attractive study as it awaits the attention of the armourers. Named 'The Old Man', the machine has three nose stripes and red, yellow and blue tail stripes to indicate the wing commander's machine (North American Aviation).

had become a USAF 'medium' type by the time of Korea due to the number of B-50s and B-36s in service. The 19th BW on Okinawa was the only available Superfortress unit when war broke out, its aircraft being identified by one black horizontal tail stripe and a single coloured stripe around the forward fuselage aft of the perspex nose cone: red for the 28th BS, green for the 30th and blue for the 93rd. A squadron badge was positioned on the fin above the black stripe, the 93rd's being a Red Indian head on a circular background. As missions piled up, so a bomb log appeared on the noses of many machines, together with names and elaborate nose art.

To increase the bombing effort, SAC despatched the 22nd and 92nd Wings to the war theatre on July 7, together with the RB-29-equipped 31st Reconnaissance Squadron. The 92nd did not remain long, returning to the US on October 15; its operational markings in Korea are believed to have been those carried before the war, diamond-W in black on the fin/rudder. The 327th BS used such markings, with a yellow fin/rudder tip to identify the unit.

The 22nd Wing used a circle-W tail marking, again with coloured tail tips to identify squadrons, and some aircraft carried the 15th Air Force badge on the fin fillet. Two more SAC B-29 Wings, the 15th AF's 98th and the 2nd AF's 307th, moved to Japan on August 1 and both were in action within days of arrival. The 98th's wing markings were square-H, with the component 343rd, 344th and 345th Squadrons identified by fin tips with alternate black and coloured diagonal stripes. Known colours are yellow/white, red and probably green, although exact identities are uncertain. The pre-war marking for the 307th Wing was a hollow black arrowhead, with squadron colours on the tail tip; light blue and green being used by two of its squadrons.

The 98th particularly — although probably not exclusively — had a number of aircraft marked with large rear fuselage identity markings, a *single* letter and the last three digits of the serial. As such these were not true buzz numbers and may have served to distinguish flight elements within squadrons. Known prefix letters include 'A', 'B' and 'C'.

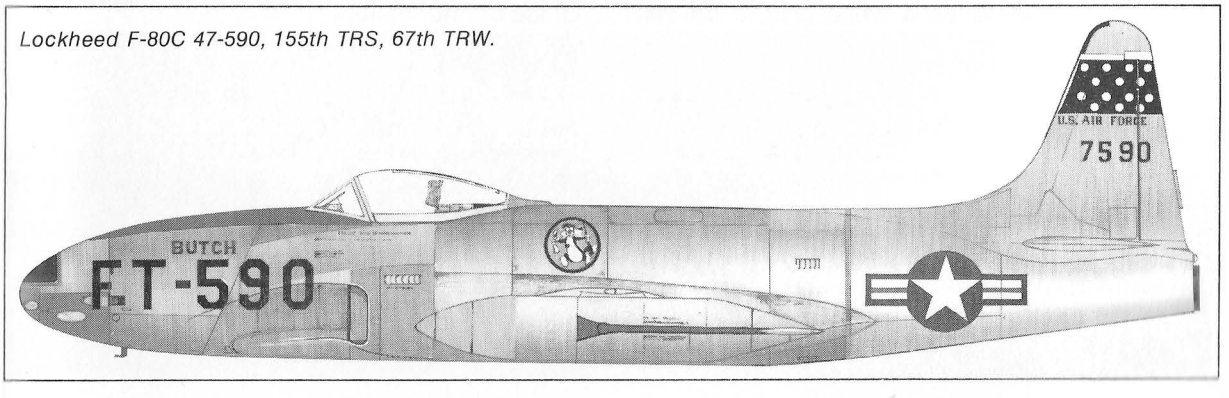
The 98th Wing also appears to have had more black-bottomed B-29s than other units, this 'in the field' paintwork sometimes extending to the entire vertical tail surfaces. The fuselage demarkation line of the black paint with NMF was roughly halfway, usually with a scalloped edge, although the regularity of this varied between aircraft.

RB-29s of the 31st Recon Squadron carried circle-X tail markings, mission symbols taking the form of black camera silhouettes.

B-26 Invader (BC-)

The 3rd BW fought all through the war, initially as a two-squadron formation comprising the 8th and 13th Squadrons, the 731st BS of the 452nd Wing being attached from November 1950 until June 1951 when it became the 90th BS to give the 3rd

Lockheed F-80C 47-590, 155th TRS, 67th TRW.



Left *The 19th Bomb Wing's 'Command Decision' piled up an impressive combat record and claimed five MiG-15s shot down. The fuselage of the aircraft is now on display at the USAF Museum, Dayton, Ohio* (USAF Museum via R. Warren). **Foot of page** *A B-26C of the 452nd BW taxies out for take-off in June 1951. Parked to the left is 43-5909 in similar NMF, buzz number, branch of service identification and serial number across fin and rudder and matt black inboard engine cowling panels. Colour trim on the vertical tails of 452nd Wing Invaders tended to be confined to the fin* (USAF).

Wing back all its old unit designations. As such, squadron colours are believed to have been those used on A-20s in World War 2 — yellow for the 8th, red for the 13th and white for the 90th. These colours were applied to the upper tip of the fin and rudder and to wingtips.

Initially NMF B-26s were used, individual machines being identified by a single fin letter, serial and rear fuselage buzz number in black. A similar basic scheme was carried by Invaders of the 452nd Wing, which became the 17th BW on May 10 1952, by which time the majority had been painted black overall with identification markings in red. The 17th Wing comprised the 34th, 37th and 95th Squadrons, the 34th using blue on the fin tip of its aircraft. Red trim marked machines of the 37th Squadron, the colour extending to a band and 'blaze' design on the engine cowlings, wingtips, tailplane tips, small fuselage intakes and the corners of the undercarriage doors.

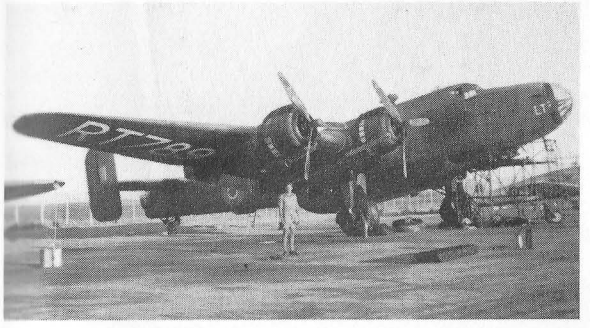
Squadrons of the 452nd and 17th Wings applied squadron badges to the noses of their Invaders, the latter's 34th Squadron using the familiar black 'Thunderbird' device on a white disc, a pre-war insignia which had appeared on many squadron aircraft, including B-25s, early in World War 2.

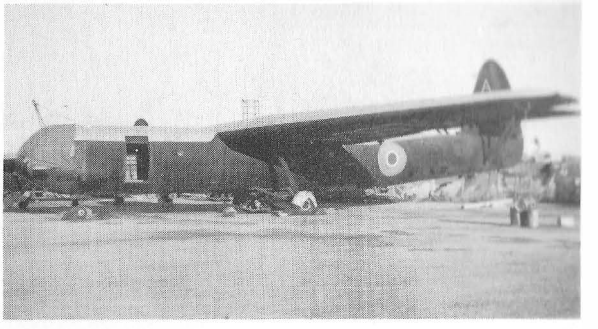
Mission markers were widely applied to NMF Invaders, although the practice appears to have been more limited on black-finished aircraft. Nose art and names were popular on both perspex- and solid-nosed machines. As with F-51s, Korean B-26s drawn from the ANG tended to retain some colour trim applied by Guard units; the cowling blaze marking was carried by a number of different units and red trim on certain machines is believed to have originated in the US rather than the war zone. In general, the propeller-driven aircraft used in Korea were drawn from each and every possible source, the regular air force being well below required strength when the war broke out. Many examples had plenty of time 'on the clock' as well, a fact not only obvious from their serial numbers, but by World War 2 olive drab camouflage in a few cases.

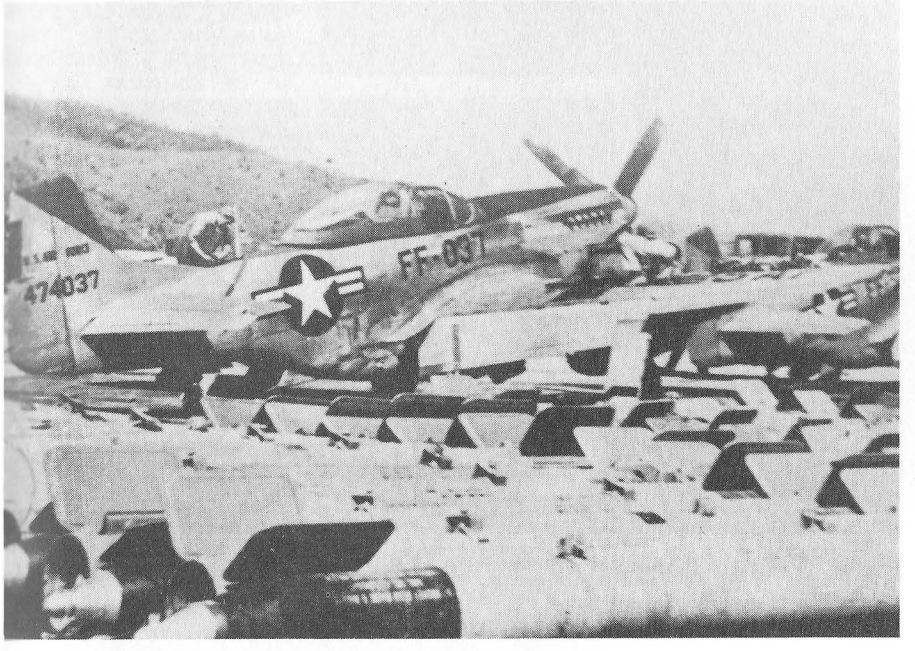
The author greatly appreciates the help of Richard Leask Ward, Dana Bell, William R. Dooner, Roger Warren, and Peter R. Hefler of the USAF Office of information. □

THE PICK OF PHOTOPAGE

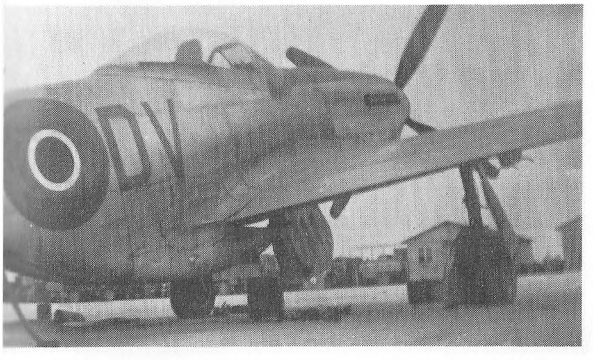
Michael J. F. Bowyer offers a new selection of rare and interesting photos from *Airfix Magazine* readers

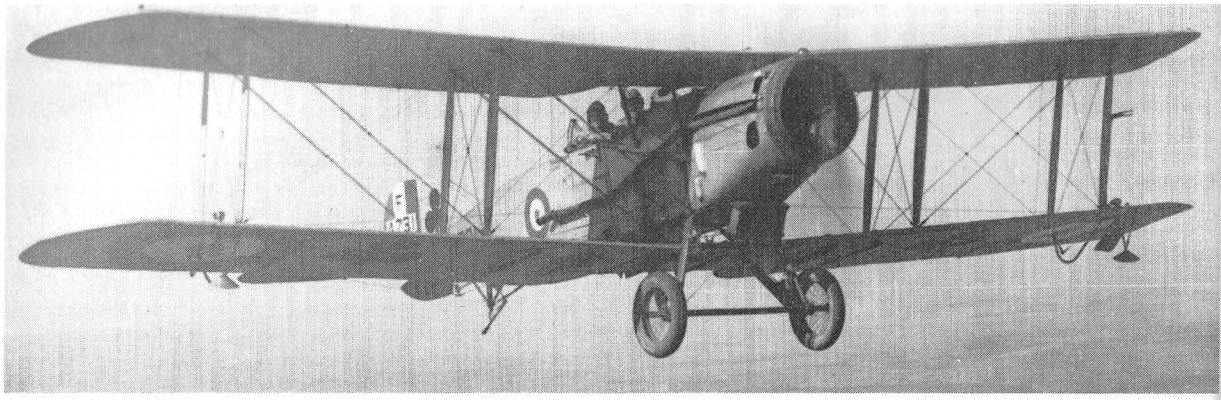


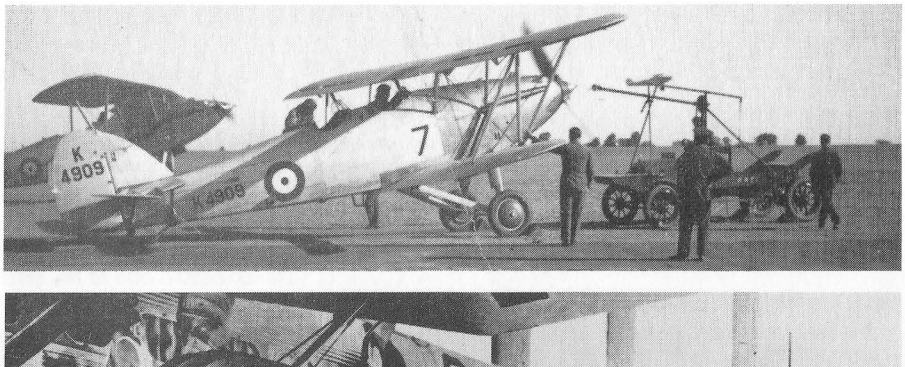




Above *Glider and tug. Halifax A IX RT789 was one of the towing aircraft for Horsa TL504, one of the rare pictures of this type of glider in the Middle East* (P. Simms). **Left** *F-51s of the 67th (Red Scarf) Squadron, 18th FBW, in Korea in 1950-1951. Nearest is 47-4037* (M. Schoeman). **Below left** *Mustang IV of 129 Squadron carrying its 'DV' codes* (M. J. Smith). **Below right** *K7537 was a Hawker Audax* (R. Kirby).

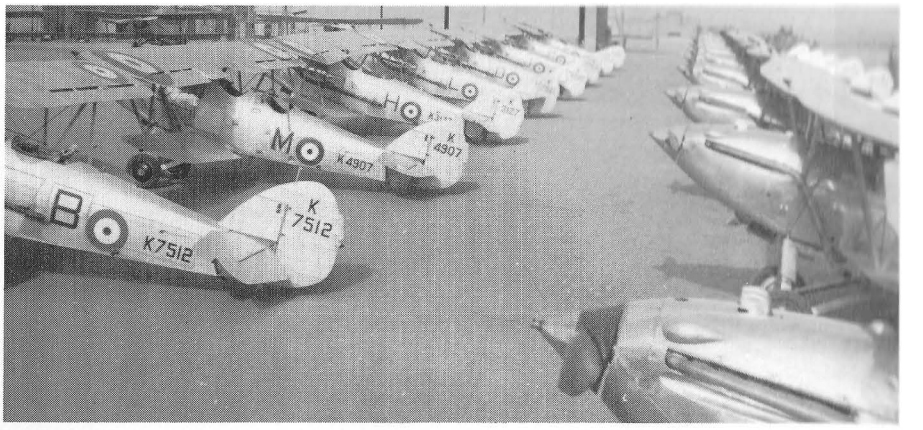


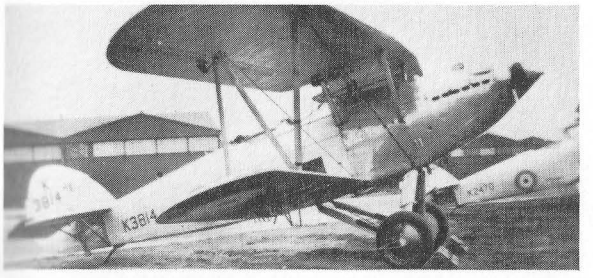


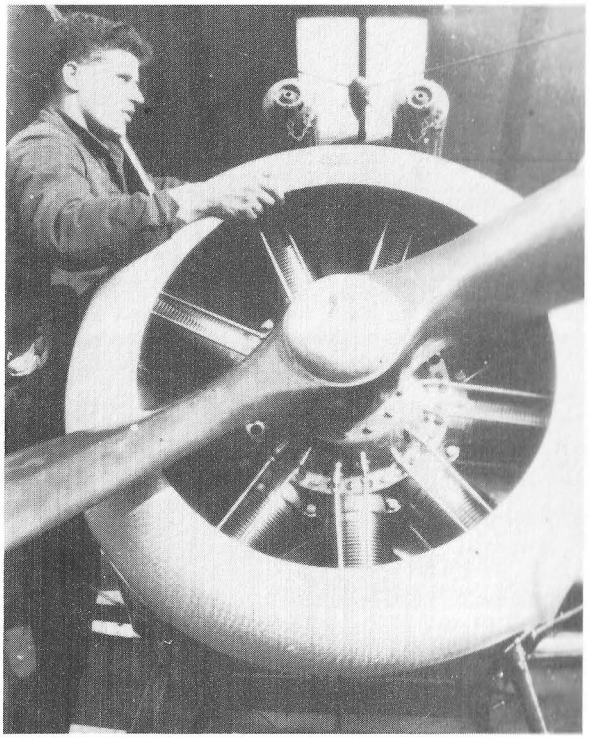


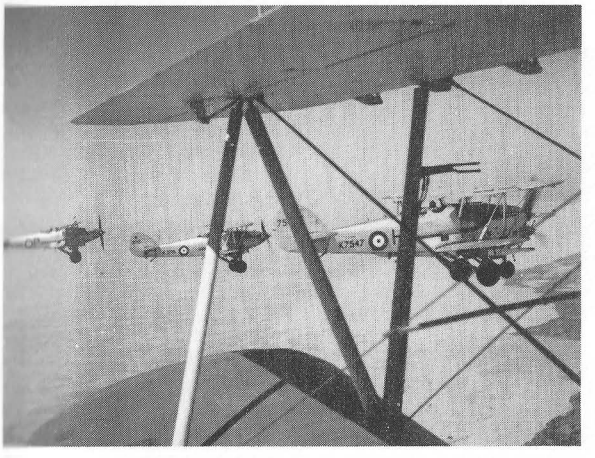
Above *It reeks of nostalgia, doesn't it? Bristol F2B F4731 of 208 Squadron* (D. Cowton). **Upper left** *An interesting shot of Hawker Hart K4909 of 4 FTS with a Hucks Starter on the right* (via R. Kirby). **Lower left** *Drama in the sun: Handley Page HP 42 Horsa force-landed in the desert in 1935. The crew of an 84 Squadron Vincent located it two weeks later. The crew and passengers seen here making the best of things were rescued* (R. Kirby). **Bottom** *A group of Auster AOP VIs of 652 Squadron at Nienburg, Germany, in 1946* (G. Bather). **Facing page, bottom** *A most interesting shot of Halifax III MZ660 of 432 Squadron with a ventral turret. 23 sorties are recorded on the nose* (A. Tough).

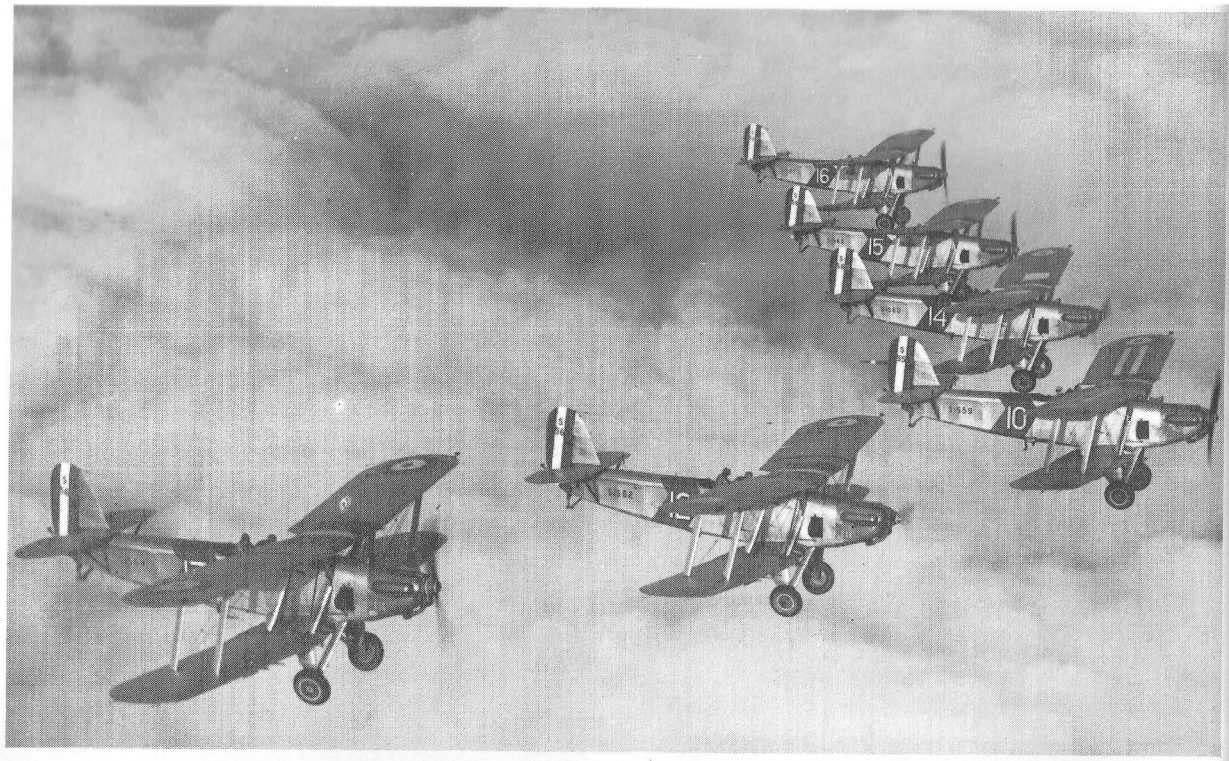
Left *Audaxes and a Hart (K4907) of 4 FTS at Abu Sueir. Note differences in upper wing roundel sizes* (via R. Kirby). **Below right** *Servicing a Camel* (H. Constable). **Below** *More Harts (K3814 and K2470) and Audaxes of 4 FTS* (via R. Kirby).











Above *Shame they weren't flying in the last Jubilee Review. Blackburn Ripons led by S1559:10* (unnamed contributor). **Left** *The famous Avro York 'Ascalon' in which Winston Churchill travelled to the Tehran Conference* (M. Schoeman). **Below** *Vickers Valentia K4635 at Khormaksar in 1939* via G. Burn).

ORIENTAL WARPAINT

Bryan Philpott examines the controversial issue of RAF colour schemes in the Far East

A Thunderbolt of an unknown squadron clearly showing the small size SEAC underwing roundels (via Richard Leask Ward).

The whole question of camouflage schemes and markings is one which is frequently aired in modelling circles, and quite often it is hard to differentiate between fact and fiction.

On the one hand we often come across the man who has spent years studying the subject purely from the official view and has convinced himself that what was laid down in official documents and instructions must be true. At the other end of the scale is the man who views all such documentation as something originated by an office staffed by faceless clerks completely unaware that units in the field had more important matters at hand than the colours their aircraft should be painted in. Between these two extremes lies the truth.

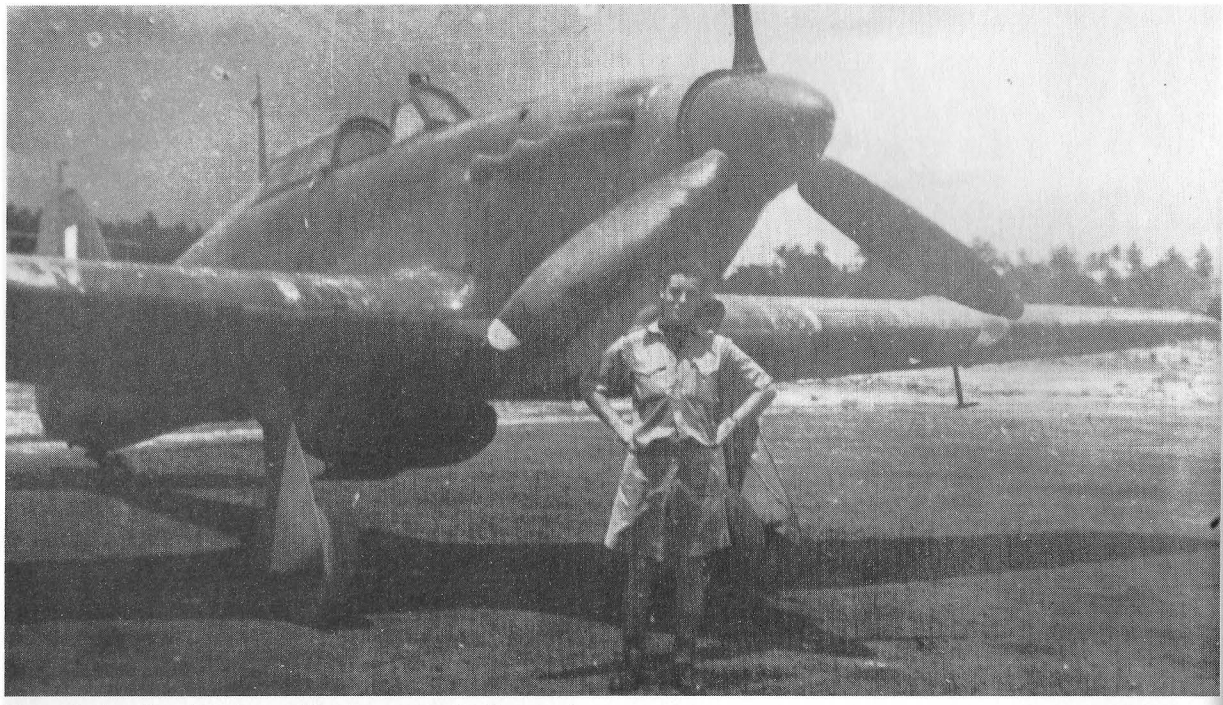
It must be made quite clear from the start that there were, and indeed still are, strict regulations covering camouflage schemes, their application, and the type of paint to be used. But from a modelling point of view one must adopt an approach that is acceptable to the individual concerned. In the past many thousands of words have been written that were not really necessary and have led to frustration, disappointment, and in some cases the complete destruction of a hobby which was giving pleasure. Pleasure is, in my opinion, the key word to any hobby, and whilst not advocating that accepted standards should go by the board and an 'anything will do' approach be adopted, I strongly feel that a much more lenient attitude should be adopted by the many so called 'experts' many of whom are self-appointed anyway.

The main purpose of this short piece is not to make categoric statements that such and such applied, but merely to illustrate how it is possible during research to come across evidence that things were not always done by the book.

Since the growth of plastic modelling as a hobby, there have been many books and monographs published on aircraft camouflage schemes in Europe and the Middle East and much of the information is accurate and sound, but equally a lot is based purely on conjecture and without too much effort can be proved to be hopelessly inaccurate. Similarly, many have rushed into print with articles which no doubt have been produced with great sincerity, in which the author has set out to explain in great detail how reduction in scale from the original to the model must also be taken into account when the painting stage is arrived at. Advice is given on toning down colours, allowing for the effects of sunlight, rain and other climatic conditions. No doubt all good sound advice, but perhaps taking things a little too far if the hobby is to be kept in its correct perspective.

As far as the Far East Theatre is concerned, there has not been so much advice and it is an area where there are still a lot of questions unanswered; many are likely to remain so since a vast number of records were destroyed.

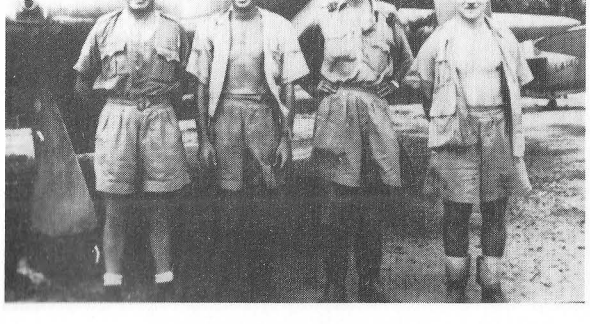
During research for one of the Osprey Air-



One of the first Hurricane IIbs to arrive in Burma in January 1942. This aircraft was with No 17 Squadron and was in standard Middle East camouflage (Wing Commander C. Stone).

cam/Airwar series on this theatre of operations I was fortunate enough to encounter several fighter pilots who were able to throw some light on the situation. In some cases it is dangerous to rely on personal memory especially after a period of 30 odd years, but occasionally one does come across evidence which is hard to dispute. Such an occasion occurred when I interviewed the former CO of

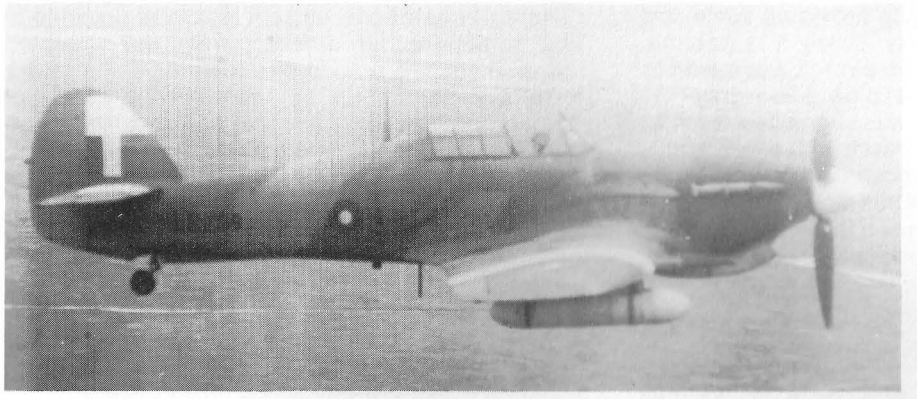
Although this photograph does not show too much of the aircraft, there is enough to confirm a sand/brown scheme and the fin flash on the Hurricane in the background is also of interest (Wing Commander C. Stone).



No 17 Squadron, Wing Commander C.A.C. Stone, DFC, who at the time of his experiences in Burma was an accomplished artist, and in fact now follows this vocation as a profession. Having fought through France with No 3 Squadron and taken part in the Battle of Britain, 'Bunny' Stone was sent to Burma in December 1941 and from the time of his arrival kept meticulous notes on colour schemes, not only of his aircraft but also the surrounding environment.

His photograph album included pictures of aircraft in a variety of marking styles including every type of roundel and fin flash ever seen on RAF aircraft. In lots of cases support for these came from the many drawings the Wing Commander completed during his service in the Far East. The first three Hurricanes to arrive with 17 Squadron were in the normal Middle East scheme of Sand/Brown and Azure Blue undersurfaces, with A1 style fuselage roundels, 45-inch diameter type A top wing roundels and three equal 8-inch division fin flashes. I was told that an instruction had been received to change the camouflage, but the three aircraft concerned were put into immediate action and this instruction was never carried out.

From the information available it certainly looked as though the standard European Temperate Land Scheme was very common, but there was also strong supporting evidence that once the aircraft had the small SEAC roundels applied in 1943, the most commonly used camouflage was brown/green top surfaces and light grey undersurfaces. There was also a very wide interpretation in the field as to the size of the SEAC roundel and its associate fin flash. In many cases these were very



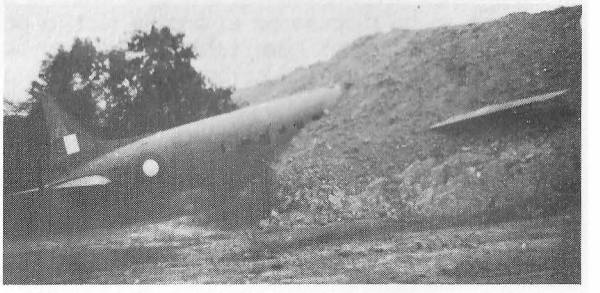
Below *This rather unfortunate Dakota carries an interestingly proportioned SEAC fuselage roundel* (via Richard Leask Ward). **Left** *A No 28 Squadron Hurricane with green/brown camouflage and small-style SEAC markings* (via Richard Leask Ward). **Foot of page** *Thunderbolt Mk IIs of No 113 Squadron. These have white serials but is the camouflage green/brown or green/grey?* (via Geoff Thomas).

small, in others they appeared to be the original roundel sizes over-painted. Perhaps a temporary measure until the complete aircraft was repainted?

On the question of the often quoted grey/green top surface camouflage, the Wing Commander assured me that he did not see any RAF aircraft finished in this scheme until well after the Japanese surrender. This does not mean that it did not exist but does perhaps suggest that it was not as common as we are sometimes led to believe. Another fact which appears to support this, is that one of my leads from Wing Commander Stone led to a No 135 Squadron Thunderbolt pilot, who also had a marvellous photographic collection but not the supporting written details.

This pilot also operated Hurricanes in the early days of the campaign and his statement to the effect that 'my memories of the Hurricane colours are rather dim, but I do recall that some were more 'sandy' than others', seems to verify the presence of more Middle East colours than we perhaps thought.

On the question of the Thunderbolt, the Mk Is operated by No 135 would almost certainly appear to have been camouflaged in green/brown/grey, and this squadron never had the green/grey scheme. This does more or less confirm the opinions of some of the people who have for many years tried to unravel the mystery which surrounds this



particular question.

Many years ago in the magazine *Aeromodeller,* the whole subject of these two particular schemes was discussed in great detail in the readers' letters page. Cuttings from those magazines show that another No 135 Squadron pilot was of the same opinion, since he states that all Mk Is were in green/brown and most Mk IIs in green/grey, with the exception of some late delivered Mk IIs which were natural metal. The same cuttings also produce an answer to a letter, from G. R. Duval, in which he states that some colour schemes he had shown on a previously published drawing, were based on his personal observations of the aircraft concerned. But of greater interest are Mr Duval's comments concerning the 'fastness' of the earth (brown) colour used; this apparently very quickly weathered to a dirty grey colour. This simple obser-

vation could go a long way to providing some sort of answer to the controversy, surely it is possible that many of the green/brown aircraft weathered to a state whereby they looked to be green/grey?

Another statement which was suggested to me as a safe guide line was that aircraft with black serials were green/brown and those with white were green/grey. But how safe is this statement? I would suggest that it can only be used in its very broadest context unless someone has positive proof that it is in fact correct. After all, it is really like saying that all Hurricanes with a type A1 fuselage roundels seen in the Far East theatre, were in Middle East schemes and this was certainly not so.

The subject of Far East and SEAC camouflage and markings is a fascinating one and there is a great deal to be discovered to enable fact to be sorted out from fiction. I don't think it will ever be possible to be 100 per cent certain on every aspect of it. But then I also think this equally applies to any theatre of operations, since it is always possible to find something far different from the accepted 'norm' if you are prepared to look for it. Perhaps a lot of questions could be answered by readers of this Annual and I am sure that not only the editor, but all of us who are interested to a greater or lesser degree would be eternally grateful for any scrap of information that might come from such sources. As previously stated, I have not set out to lay down any hard and fast rules, but merely to show how certain information can come to light which conclusively proves certain points, whilst others remain as much in the dark as they ever were.

The accompanying drawings by Martin Holbrook illustrate some of the schemes researched by Geoff Thomas, a man who has spent many years studying this theatre, and it is hoped that they will at least enable some modellers to include SEAC aircraft in their collections and be as sure as it is possible to be that they will be fairly representative. □

Key to colour plates. 1 *Mosquito FB VI HR631 'M' of 110 Squadron, Burma and India, 1945. One pilot was W/O T. J. R. Bird. This aircraft was formerly on strength of 47 Squadron in 1944.* **2** *Spitfire LF VIII MS-X:LV659 of 273 Squadron at Kyaukpyu and Mingaladon, Burma, 1945.* **3** *Beaufighter TF X NE646 'V' of 211 Squadron at Chiringa, 1945.* **4** *Republic P-47D-25 Thunderbolt Mk 2 flown by Squadron Leader W. M. Soutter of 42 Squadron at Meiktila, Burma, in August 1945.* **(Paintings by Martin Holbrook).**

1
M
HR631
2
MS
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AH585
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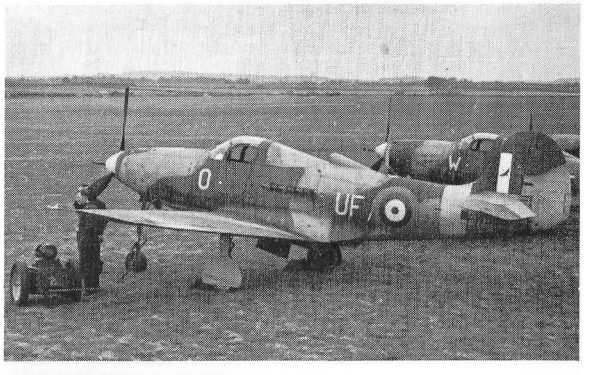
AIRACOBRAS IN THE RAF

Michael J. F. Bowyer examines the P-39's short-lived career

It had the rasping, throaty sound of a Tomahawk, but it was faster. Then the sharp wing dihedral developed into an unmistakable long-nosed shape. Here, on the morning of July 13 1941, the Airacobra had first flown my way. As it circled I watched the then unusual undercarriage being lowered. The main wheel units were so stubby in contrast to that very long nosewheel leg. By chance I was witnessing the arrival of the first Airacobra at Duxford, DS174, and for the next six months these aircraft would be almost a daily sight overhead.

Considering American fighters of the 1930s to be hopelessly under-armed, Robert J. Wood set out to design the 35-foot wing span Bell 14 around a 37 mm cannon. Accepting the heavy recoil factor he decided to position the gun on the aircraft's centre line so it fired through the propeller hub. Thus, the 1,150 hp Allison V-1710-17 had to be sited, uncon-

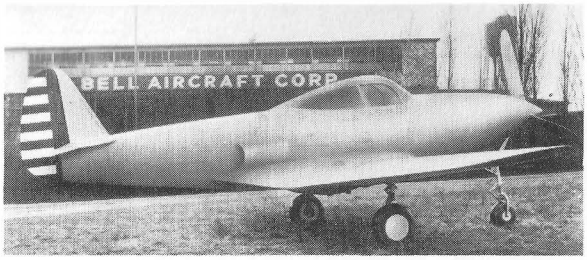
Ground crews line up before their charges. AH585 'O' nearest, AH602 'W', AH587 'N' and AH592 stand in that order. Note the tented accommodation, shelters and absence of concrete dispersals at Duxford (Flight).

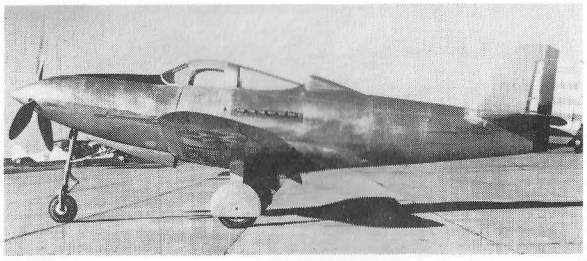


Key to colour plates. *David Dean's paintings depict UF-O:AH585 as it appeared during its short-lived service with 601 (County of London) Squadron at Duxford in late 1941. Finish is Dark Green and a light shade of Ocean Grey on the upper surfaces with Sky codes, spinner and fuselage band, and Light Aircraft Grey under surfaces. Note badge on fin flash. This machine is shown in two of the accompanying photographs. It joined 601 Squadron on September 26 1941 and was damaged on February 7 1942 when it swung into a deep snow drift. Taken to Reid and Sigrist for repair and later to Hamble, it was instead struck off charge on June 12 1942.*

Bell Airacobra Mk 1 data

Engine	One Allison V-1710-E4 of 1,150 hp
Wingspan	34 feet
Length	34 feet 2 inches
Height	9 feet 3 inches
Armament	One 20 mm cannon firing through propeller boss plus two .50 cal machine-guns in nose and four .303 machine-guns in wings
Performance	Maximum level TAS 335 mph at 13,000 feet; maximum rate of climb 2,040 fpm at 10,300 feet; service ceiling 29,000 feet; maximum range 1,098 miles.
Weights	Empty 5,360 lb; loaded 7,830 lb.





Above left *The prototype Airacobra photographed on December 15 1938. The fine lines of the first machine are very evident.* **Above right** *Some of the fine lines were lost by the time the YP-39 was in being. The photograph here was taken on October 16 1940* (Bell Aerospace Textron).

ventionally, amidships — indeed, immediately aft of the pilot's cockpit which straddled the ten-foot extended propeller shaft offset to the port side of the fuselage. Reduction gear housing would contain a shaft within which would be the cannon, backed by an assortment of .30 and .50 calibre machine-guns.

This arrangement left sufficient space in the nose for the then equally unconventional nosewheel undercarriage. The general arrangement usefully centred the main load, leading to a very clean nose design shorn of a drag-inducing radiator intake, and gave a good view forward for the pilot. All in all it seemed that the highly streamlined machine was assured of a great future.

Impressed, the US Army Air Corps ordered a prototype, designated XP-39, in October 1937 and numbered it 38-326. Before the prototype flew, 13 development YP-39s, 40-27 to 39, were ordered in April 1939. On September 13 1939 the first order for P-39 production aircraft was placed.

In late 1939 the XP-39 began flight trials but trouble with the oil overheating and pressure falling off necessitated enlarged rear air scoops being fitted to the oil coolers. Then it was found that the trouble stemmed from restricted oil flow, so a re-designed flow pipe was installed leading from the oil tank. Nevertheless, the 1,150 hp Allison produced a top speed of 390 mph, impressive at that time, and the order for 13 YP-39s was confirmed.

When Bell received the machine back from government trials they moved the engine air intakes from aft of the engine to the wing roots and reduced the wing span to 34 feet. The canopy was lowered, the fuselage lengthened from 28 feet 8 inches to 29 feet 9 inches and the machine redesignated XP-39B. The carburettor intake was now sited behind the canopy. The turbo superchargers were removed and a 1,090 hp V-1710-37 engine was installed which, although it offered 60 hp less, would speed production. A retrograde step, maybe, but cheaper.

Once the YP-39s were flying it was apparent that, based upon the modified prototype, their performance was reduced. The intended top speed of 375 mph true air speed (TAS) was supposed to be reached at around 20,000 feet, climb to that altitude taking about six minutes, but in reality the top speed was only 368 mph because extra weight of armament and operational equipment had nullified efforts to reduce drag. YP-39s with the 1,150 hp Allison V-1710-35 (or E4) peaked at 12,000 feet and were modified into the YP-39A for high altitude use. Retaining the same engine they had an all-up weight of 7,250 lb and a top speed of 380 mph.

The first production order for 80 aircraft, 40-2971-3050, was now changed to an order for P-45s and the many modifications made virtually pro-

A Bell P-39D Airacobra, showing the shape of the production aircraft — still very clean in flight (Bell).

duced a new aircraft. Then, for what might best be called 'political reasons', the designation reverted to P-39C which had an Allison V-1710-35, a top speed of 370 mph and all-up weight of 7,025 lb. Initial delivery came in 1940 and, when armour protection and self-sealing fuel tanks were added, P-39s were again redesignated P-39Ds from the 21st example onwards. Whereas the XP-39 weighed in at 6,204 lb the 60 P-39Ds, 40-2991-3050, tipped the scales at about 8,200 lb.

British interest in new American types naturally centred on the lighter P-39 and in 1940 the British Air Purchasing Commission ordered 675 based upon the P-400 version which they named Caribou and were originally intended for France. Unfortunately the version ordered still had a low altitude engine, but the British, impressed by the layout of the aircraft, felt that it might be a fine ground attack machine.

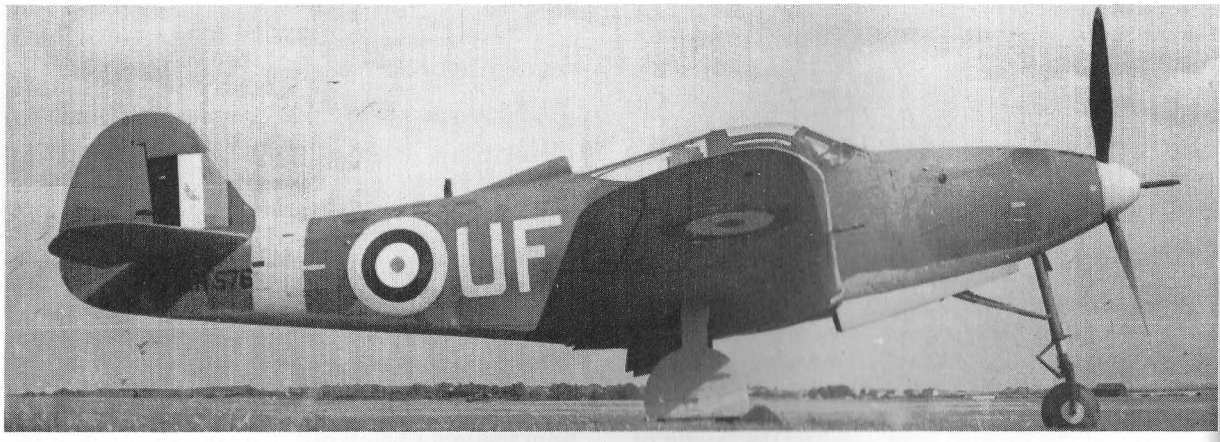
Production aircraft began to reach the USAAC's 31st Fighter Group in February 1941, by which time the paramount British need was for good interceptor fighters in case a new 'Battle of Britain' developed. It was soon apparent that, when operationally loaded, the new fighter had much reduced acceleration, a poor ceiling and was not exceptionally manoeuvrable. The P-400 version was almost rejected by the British because it lacked a supercharger which meant that its speed was likely to fall away above 10,000 feet, although the 20 mm nose cannon was an attractive feature. A British order was later confirmed for 675 examples of the P-400 Caribou, re-named Airacobra to bring it into line with the American nomenclature.

As soon as the P-39s went into service troubles appeared with the transmission shaft which led to much unserviceability. There were cannon problems too, but delivery of the P-400 (similar to the P-39C) to the RAF went ahead amid some misgivings. If the Airacobra was to operate on strafing missions alonside the Hurricanes and Spitfires it could only do so by proving itself a worthy companion on trials.

Shipments began to arrive in June-July 1941 at Liverpool and three trials aircraft were erected at No 4 Aircraft Assembly Unit. DS173 flew first and was passed to A&AEE Boscombe Down in early July followed by DS174 which went to Duxford for tactical trials. These three machines were non-standard having a 12-volt electrical system for which replacement parts were in short supply. Air Service Training at Hamble were appointed the Civilian Repair Organisation to back the aircraft in service. They received their first example, AH572, from the main batch of 170 examples, AH-570-739, for experience on July 15 1941. AH573 passed quickly from A&AEE to AFDU on July 30 1941 but repeated unserviceability retarded trials at both establishments, and it was some months before reports on the aircraft were complete, by which time the RAF had in any case rejected it.

One of the trials aircraft, DS174, photographed at Duxford in the summer of 1941 (IWM).

For Boscombe's trials AH573 maintained a take-off weight of 7,830 lb but before climb trials were completed it crashed. AH589 took its place but there were constant ignition troubles with the new aircraft and trials had to be transferred to AH701 whose usual take-off weight was 7,845 lb. Originally this aircraft had been allocated for gun heating trials but speed trials were conducted instead, from which it was deduced that the best climb-away speed was 150 mph held to 2,000 feet then increased by 5 mph per 2,000 feet. Its Allison



AH576 photographed at Duxford in August 1941 had a very brief service life of just over three weeks (IWM).

V-1710-E4 drove a Curtiss Electric constant-speed propeller, and the armament was a 20 mm cannon in the nose, two .50 nose guns and four .30 calibre wing guns which distinguished the Mk 1. Camouflage of AH573 was somewhat unusual. Like the 'DS' examples it was basically painted in Dark Green-Dark Earth with Sky under surfaces. The latter swept along the sides of the nose until midway from the spinner, and from beneath the rear fuselage to the roundel then aft and upwards to join almost the top of the Sky fuselage band, aft of which the entire fuselage was Sky. Operational machines were finished in Dark Green and a shade of Ocean Grey lighter than the laid down tone. Under surfaces were Medium Sea Grey.

It appeared from the trials that maximum rate of climb was 2,040 feet per minute at 10,300 feet, service ceiling 29,000 feet, time to 10,000 feet 5.1 minutes and to 20,000 feet 11.7 minutes. Maximum level TAS was 335 mph at 13,000 feet. Some Airacobras had a V-1710-E12 which gave a maximum rate of climb of 1,845 feet per minute at 12,500 feet, a service ceiling of 29,000 feet, a time to 10,000 feet of 5.5 minutes, 12.4 minutes to 20,000 feet and a maximum TAS of 365 mph at 15,600 feet. These latter tests were carried out using AH574 in 1942 at a take-off weight of 7,835 lb. This machine had the usual fuselage armament but was fitted with .50 calibre wing guns and was sometimes referred to as the Airacobra Mk 1a. Its speed was seen to fall away at 3 mph per 2,000 feet on the climb. Final assessment of its speed at 3,000 revs was 337 mph TAS at 10,000 feet, 364.5 mph at 16,500 feet (the best) and 333.5 mph at 25,000 feet. Climb to 12,500 feet took 6.85 minutes at 146 mph ASI, 28.45 minutes to 28,000 feet where the climb rate fell off to 200 fpm. The best climb was achieved at 12,500 feet, 1,845 fpm.

Meanwhile AFDU had considered the Airacobra more generally. Entry was via a side door, difficult if the engine was running, and that had to be kept at 1,000/1,200 revs to reduce vibration. The small cockpit had a low roof cover so the seat had to be lowered making baling out difficult. There were two cockpit sliding windows but no clear vision panel which would make poor weather flying difficult although the view forward and to the sides was good. Duxford's specimen flew at 7,850 lb, taxied well and had only slight take-off swing. Unstick with 15 degrees flap came at 100 mph ASI and the climb away at 140 mph was usual. Rudder and elevator controls were light and effective, the fabric-covered ailerons being light like those of the early Spitfire 1, and the Airacobra was a stable aircraft which stalled at 105 mph ASI, and at 88 mph with undercarriage and flaps down. Aerobatics were easy and when landing it was easy to hold the nose off for the aircraft to settle from a glide in at 110 mph ASI. Fundamentally there seemed little wrong with the Airacobra's flying qualities and, although its performance was lower than hoped for, there was reason to hope that the aircraft would be useful.

No 601 (County of London) Squadron switched from 11 to 12 Group, from Manston to Matlask, Norfolk, on July 2 1941. They had been earmarked to be first to try the Airacobra. On August 6 the squadron received its first two Airacobras and two days later AH577 arrived. Another had been delivered to Duxford where the squadron moved, to work up alongside AFDU, on August 16 1941. There it began flying with AH577 on August 18. The first ventures were merely for conversion and handling aided by a GAL Cygnet G-AGBN with a nosewheel undercarriage which made it very useful for conversion.

The first major troubles came on August 29 when Sergeant Griggs blacked out in AH576 and had to make an emergency landing at Mildenhall. Unfortunately he chose the wrong undercarriage switch and the aircraft belly landed, damaging the propeller and fuselage and injuring Griggs. The same day Sergeant Bell force-landed at Oakington with a glycol leak and power loss. Three days later a climb to above 30,000 feet seemed to augur well.

On September 19 Sergeant Evans force-landed at Debden, again with a glycol leak and engine seiz-

ure. Another more serious accident came on September 30 when Sergeant Land came down at Langham, near Colchester, in AH596 with low fuel pressure, and was injured. Three days previously the old trouble had showed up when a drive shaft failed and the aircraft had made a forced landing at Manston.

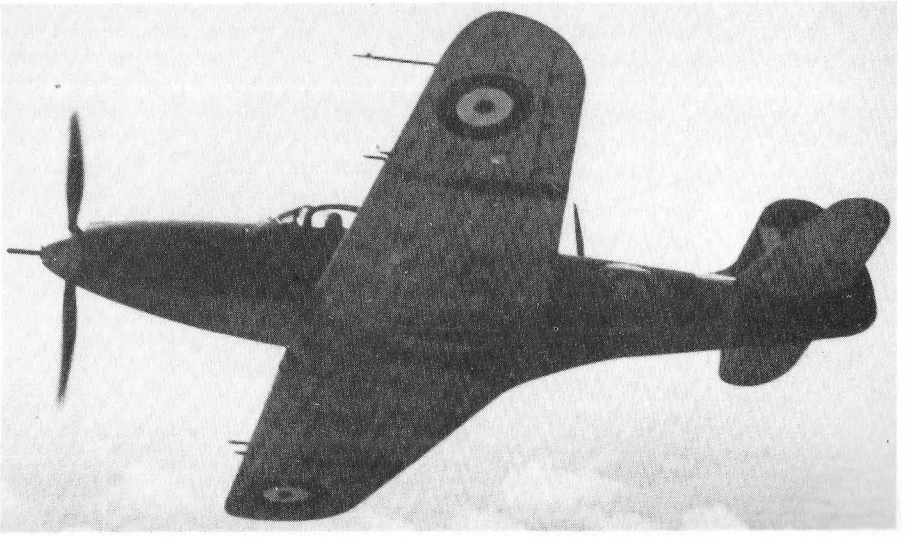
Behind the scenes ground crews were far from happy. Maintenance was a nightmare because available tools would not fit the Airacobra and the workshops at Duxford had to manufacture sets for the aircraft. The 60-round cannon were constantly affected by stoppages and the fuel feed system also gave problems. Another curious quirk of the aircraft was that the mainwheels and nosewheel were all operated by one system so that failure of one to lower meant that all would fail to come down. Modifications were put in hand to change this. Pilots feared that in accidents the power plant would break away from its mountings and hurtle forward into the cockpit, a worry that was never removed although it is doubtful whether this ever happened to an RAF Airacobra.

Events now made an unexpected turn. The Air Staff were without doubt uneasy about the aircraft, seeing it as inferior to the Spitfire V, already in trouble with the first FW 190s. They now asked that its qualities for night fighting be considered, particularly as a replacement for Hurricanes being used as satellites to Havoc Turbinlite aircraft. Behind the scenes the Americans had intimated that they wanted suggestions as to the types of aircraft they might supply to the USSR, and if Fighter Command did not want the Airacobra then the considerable numbers due in Britain might be usefully passed on.

On September 27 1941 Fighter Command sent a memorandum to 12 Group which was passed to No 601 Squadron. It was essential the squadron tried the aircraft in action and the USAAC had asked how its qualities could be improved for battle. There were three possible roles: ground attack sorties *(Rhubarbs),* close escort to bombers and night fighting. Thus, No 601 was ordered to undertake *Rhubarbs* as soon as possible to targets giving a good fuel margin, bearing in mind the aircraft's 100 gallon capacity. Such operations were only possible from an 11 Group station and escorts were not to be flown until the squadron was fully worked-up — and then only with cover by other types of fighters. The main hope, now, was that the Airacobra could be used to support the Havoc (T) and every opportunity for night flying was to be taken.

Fearing that he might lose the Airacobras before the truth was known about them, Air Marshal Sholto Douglas urged more thorough examination of the type before it was released to the Russians. 'Up to a point', he wrote, 'it is a promising and attractive job. If only the high altitude performance could be improved I think we should find them very useful.' He considered that Airacobras would be very useful for convoy protection, Fighter Command's usual task at this time, and asked that a turbo-supercharger or a bigger blower be fitted to the engine.

The first night trials were sobering. There was an essential need for flame dampers although that in no way affected the good night vision. But the exhausts burnt very brightly and when fuselage guns were fired the tremendous flashes obscured the target. Duxford set to work producing exhaust fish tail multi-ejectors, but still these did not shroud glare sufficiently. 12 fish tails were fitted on each side of the aircraft, five inches wide and projecting 2¼ inches. The fish tails glowed but when the aircraft was flying flat out a brilliant blue flame, visible for 4,000 feet, was emitted. The only cure could be louvres within the fish tails, but when in place the bright glow was still visible some way off. A simpler six fish tails per side system did little better. RAE tried their hand but clearly the Airacobra would not be suitable for night fighting without extensive



In flight the Airacobra had a dumpy appearance. The armament can be clearly seen, including the nose cannon (IWM).

work. Thus, rejection came.

By September 20 1941, the RAF had received 15 Airacobras and 30 were with MAP. Five days later an assessment revealed that 53 had reached the UK and 55 had been shipped and were still at sea. On October 1 No 601 Squadron held 14 aircraft. The biggest hold-up concerned cannon fitting. The first 170 from the USA needed to be fitted with cannon in Britain, after which the Airacobras arrived with cannon to a total of 675.

Meanwhile No 601 Squadron had been feverishly working up to operations and flights of Airacobras in twos, threes and fours were a daily sight over Cambridgeshire. On the afternoon of October 6 1941, four pilots, Flight Lieutenant Himr (in AH589), Pilot Officer Manak (AH595), Sergeant Briggs (AH583) and Sergeant Scott (AH581) flew to Manston but poor weather prevented operations on October 7 and 8 and the aircraft returned to Duxford. On October 9 AH583 and AH581 again flew to Manston and at 13.53 hours Squadron Leader Gracie took off in AH583 and shot up targets near the coast by Dunkirk. At 17.45 hours Flight Lieutenant Himr (AH583) and Sergeant Briggs (AH581) flew to Dunkirk where they fired at soldiers on the pier and shot up a trawler. At 13.35 hours on October 10 Scott left Manston in AH581 for another *Rhubarb,* shooting up canal barges behind Dunkirk town. Next morning at 08.00 hours three Airacobras flown by Pilot Officer Manak (AH595), Sergeant Chivers (AH584) and Flight Lieutenant Himr (AH583) set off with eight Hurricanes of No 615 Squadron for a shipping strike. Although they encountered some flak they saw no ships and returned at 09.00 hours with which the operational career of the RAF's Airacobras ended abruptly.

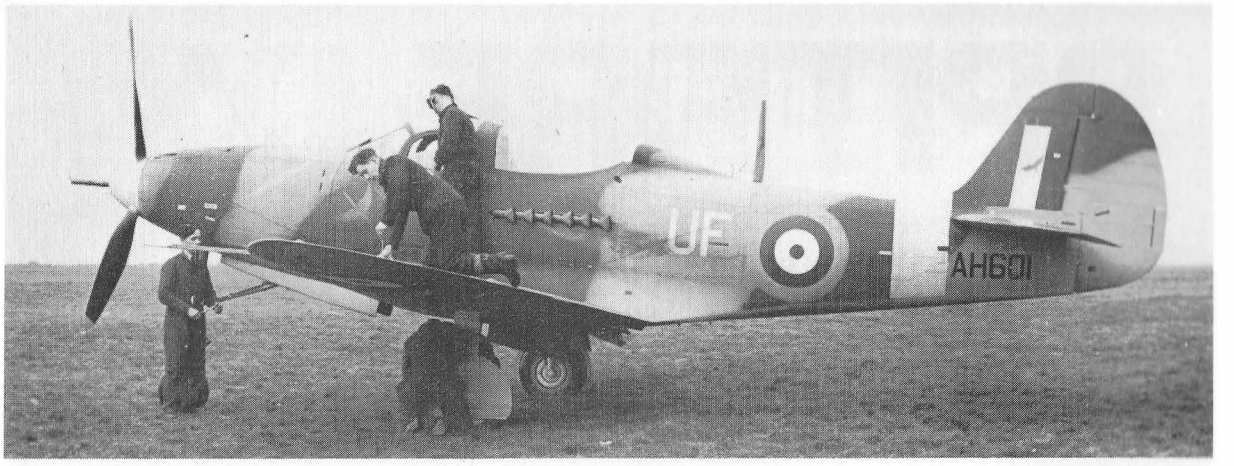
A procession of snags accounted for their withdrawal, but the main reason was one which operations had made very apparent. When the nose guns were fired this had a disastrous effect upon the working of the compass. With the Kollsman-type there was a persistent uncontrollable deviation due to the close proximity of the .50 calibre guns. When they were fired a magnetic field was set up by the electrics which was sufficient to magnetise to a large extent metallic substances in the cockpit. The story circulated that this deviation ranged from seven degrees to a staggering 165 degrees.

The Admiralty Compass Observatory was called in to help solve the problem. No British compass was immune to the trouble and the only type which seemed suitable was a Pioneer Distant Reading Compass placed in the wing, and there were very few such compasses in the country. Therefore, 20 were urgently ordered from the USA for without them No 601 Squadron could not operate. At Duxford the compass on each serviceable Airacobra had to be swung every day.

By early November 1941 Fighter Command was desperate and ordered that No 601 Squadron must not operate again. To immediately re-equip the squadron was impossible for the Typhoon re-equipment programme had been planned and the released fighters were already lined up for other squadrons. One possibility was to switch the planned Typhoons for No 266 Squadron to No 601, but in the end it was decided that No 601 should continue flying training with Airacobras and receive Spitfires released by Typhoon conversion. If the Pioneer Compass trial installation was effective then the RAF might still operate Airacobras.

The Vice-Chief of the Air Staff then weighed in with the surprising news for Fighter Command that compass deviation troubles had long been known about, and that they were not as bad as the Command suggested. The high deviation arose only in the 37 mm cannon aircraft for its trigger motor and solenoids were only 7½ inches from the compass.

AH583 was UF:J and served 601 Squadron between September 1941 and March 1942 (Flight International).



The Airacobra flown by the Commanding Officer of 601 Squadron in the autumn of 1941. AH601 served with '601' between October 10 and December 15 1941 (Flight).

In RAF Airacobras the deviation was considered to be only ±15 degrees, but admittedly uncontrollable — surely enough to damn the aircraft anyway? The trial installation of the Pioneer Compass had already been experimented with, but there was only one such compass in Britain, and that seemed faulty! The Americans too had met the same trouble. With that, Fighter Command decided they did not want an aeroplane in which nobody knew where they were going. On November 8 a party of Russians arrived at Duxford to view the Airacobra. They accepted it with glee — what's the betting nobody mentioned compasses?

Duxford needed all its resources to get the Typhoon working so, on January 5 1942, No 601 Squadron moved to Acaster Malbis taking AH580, 583, 584, 585, 587, 592, 593, 595 and 602. There they continued keeping their hand in until March 7 when AH587 made the last Airacobra flight by the Squadron. Three days later the first Spitfires arrived and life became more sensible.

This was not the end of the British use of the Airacobra for AFDU continued trials and the Air Gun Mounting Establishment at Duxford used AH701 between April and July 1942, for this was an interesting machine from an armament point of view. Boscombe Down and Farnborough continued flying trials into late summer 1942. At the turn of 1941 AH651 had arrived at Bottisham in the hands of No 225 Squadron in the hope that Army Co-operation Command might find the aircraft useful. Flying trials undertaken by No 241 Squadron were uneventful until the aircraft overshot into a hedge. CRO Hamble took its share in the maintenance of the type and it was not until February 1943 that the last one left the works.

History takes some strange twists. It was with some surprise that one saw Airacobras in profusion at Duxford in October 1942-January 1943. Their paintwork was a strange dark green and dark brown with pale grey-blue undersurfaces. They were in the hands of the six squadrons of the 81st and 350th Fighter Groups and the US insignia appeared on the fuselage sides outlined yellow. Some had black RAF serials, some had yellow RAF serials painted in small characters on their fins. Some, again, had US ARMY on their wing under surfaces. Later quite a number acquired dull brown paintwork on their upper surfaces for they were destined for north west Africa. They worked up at Duxford and Snailwell, Duxford's satellite, at Coltishall and King's Cliffe until January 1943 when many left for Africa. The 68th Recce Group also used the type at Wattisham.

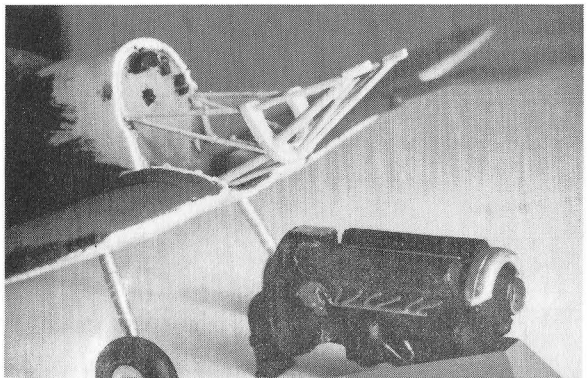
The story had still not ended. A walk around the aircraft at the 1948 SBAC Show after the flying revealed a sad AH574 fitted with an arrestor hook and which the Naval Department at RAE had used until 1948.

What happened to the 675 P-400s shipped to Britain? Some 49 appear to have been active in British hands, but most had arrived in crates, were inspected, modified and then passed on either to the USAAC or as in most cases were shipped out of east coast ports to run the rigours of the Russian convoy routes. What the RAF did not want the Russians received.

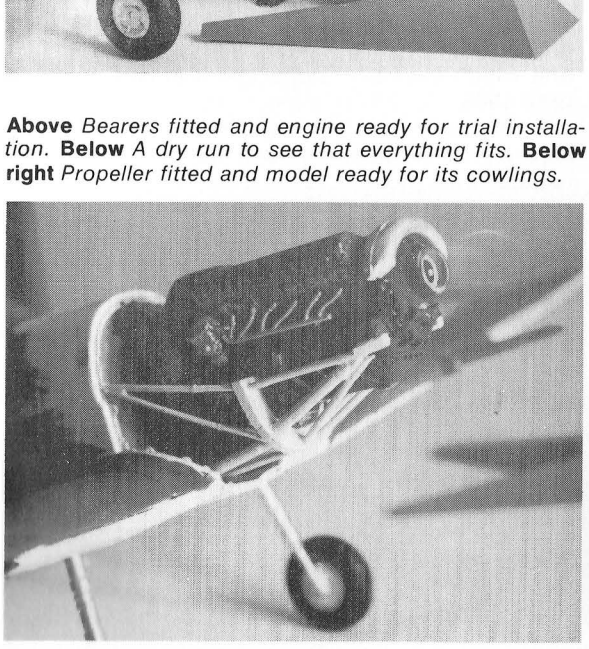
For what purpose the Russians used them we will presumably never fully know. Yet when Hampdens of No 455 Squadron flew to Russia in August 1942 two of them were intercepted by Airacobras which led them to Murmachi for a landing. Evidently some people made the compasses work — maybe they never fired the guns! □

SPITFIRE IX

Neville Franklin converts the Airfix 1:24 scale kit



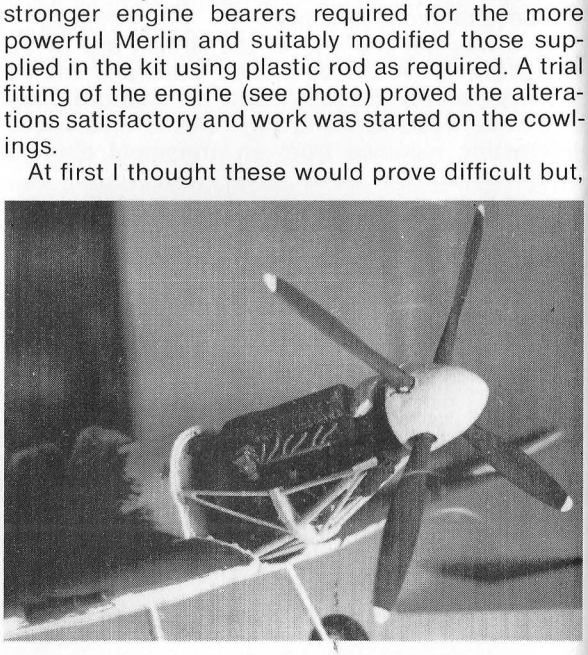
Above *Bearers fitted and engine ready for trial installation.* **Below** *A dry run to see that everything fits.* **Below right** *Propeller fitted and model ready for its cowlings.*

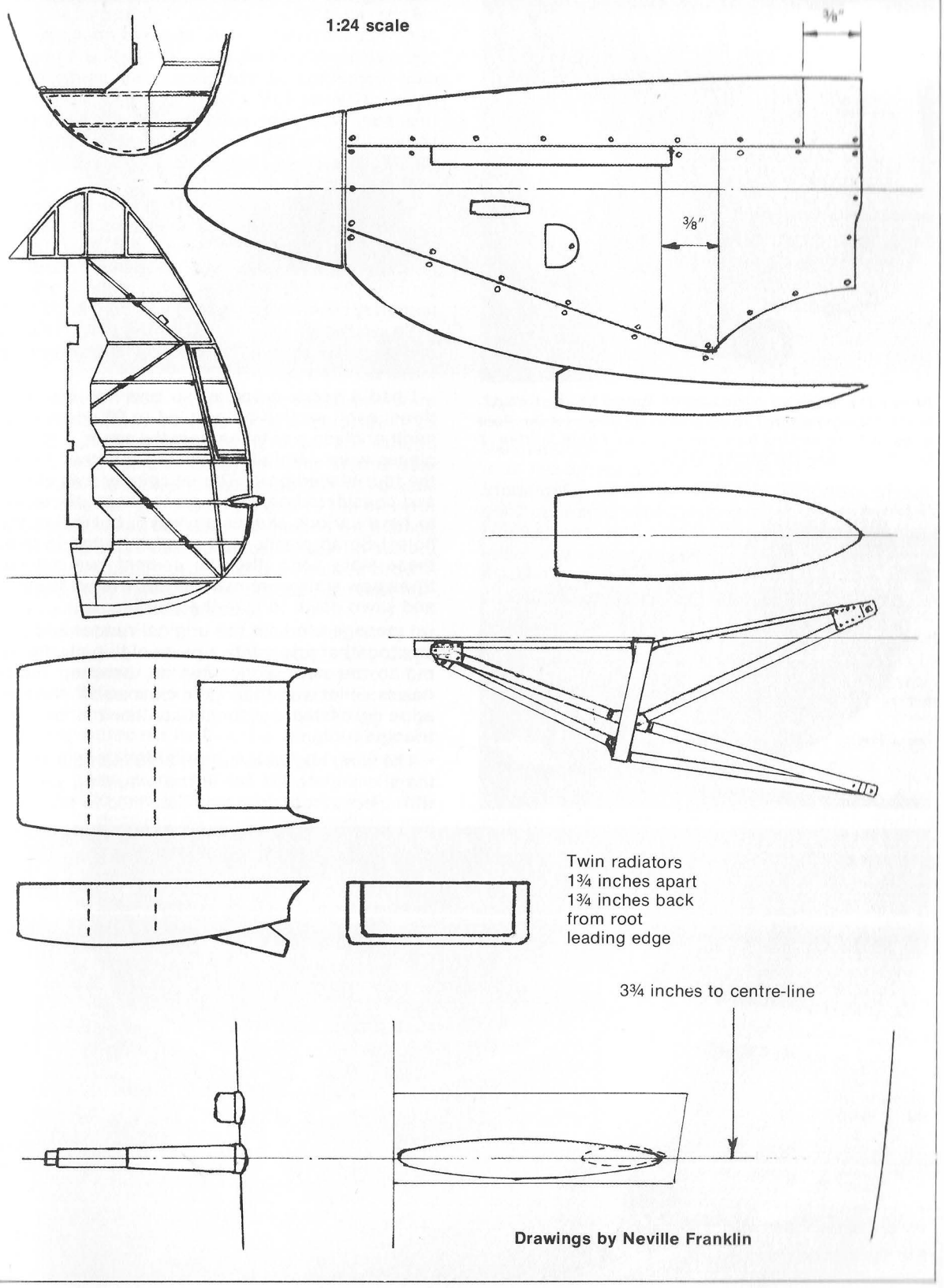


Some years ago, I became involved in the conversion of a 1:24 scale Airfix Mustang to a Dart engined version (see 1974 Annual) and, in consequence, I was left with the P-51D's 61 series Merlin engine.

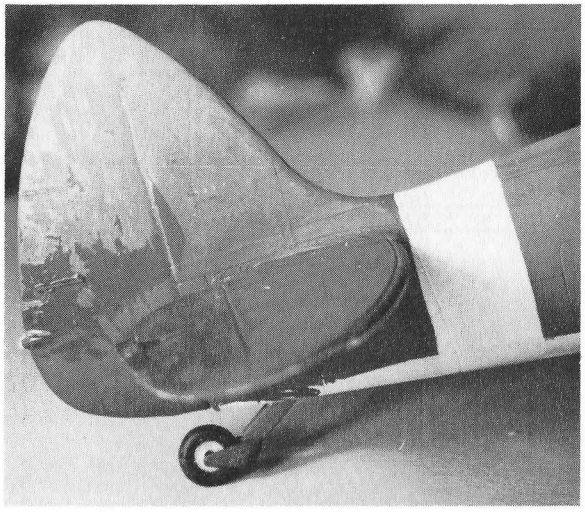
Having a scrap Airfix 1:24 scale Spitfire, which had been constructed as a crashed model for a diorama by a friend of mine, I toyed with the idea of mating the two-stage supercharged Merlin to the Mark I airframe, much as Rolls-Royce had probably done during the war. After repairing the model, removing the 'shot-up' rudder, cutting off the nose at the firewall and making up the Merlin engine, I delved in my archives for details of the longer and stronger engine bearers required for the more powerful Merlin and suitably modified those supplied in the kit using plastic rod as required. A trial fitting of the engine (see photo) proved the alterations satisfactory and work was started on the cowlings.

At first I thought these would prove difficult but,

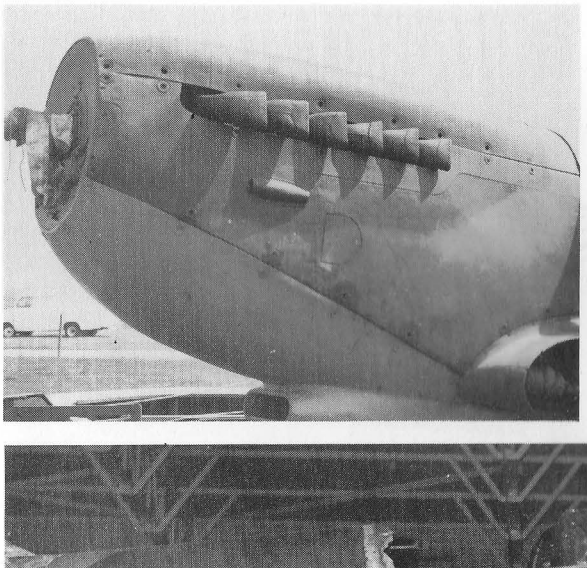




Drawings by Neville Franklin



Above *The modified Airfix rudder.* **Below** *Nose of a Spitfire IX showing ejector hoists and auxiliary air intake.* **Foot of page** *The cowlings have been removed from Spitfire IX MK732 showing the engine bearers.*



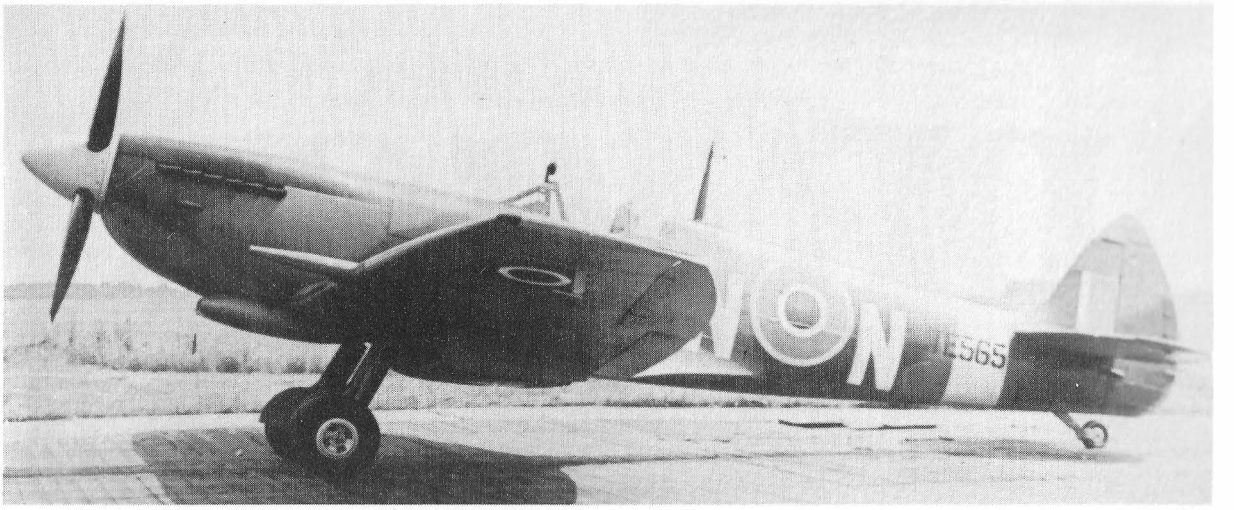
knowing the engine support bulkhead was identical on all Merlin Spitfires, I found that only a parallel extension 3/8 inch long was necessary. The top cowling (Part 149) had a strip of formed plastic card cemented at the back, this being slightly bevelled inside to fit into the rebate on the kit's fuselage. Side panels (Parts 147/148) were cut as shown, the 3/8 inch extension cemented in and joints cleaned up after allowing the pieces to set well.

I had already decided that I would fix the cowlings on this model as I had problems on an earlier one where the pieces would not stay put so, although the engine was properly finished, in slightly gloss black, Rolls-Royce style, it was permanently covered up. A piece was bent and fitted to mate up the under cowling to the wing, this joint being largely covered by the new larger air intake made up from scrap.

I had a scrap propeller so one hub was cut in three, each section being filed to 90 degrees, and another blade was taken from the spare. These four pieces were carefully cemented together to make the four-bladed prop. The kit spinner was checked and considered near enough to shape (these seem to have various shapes anyway!), but it had three holes! Scrap plastic was carefully fitted in two of these slots and, after the cement had set hard, three new slots were marked out, drilled at the end and sawn down to take the four blades.

I managed to split the original rudder and glued this together again with a piece of thin plastic card, cut to the new rudder outline, between the two halves. Filler was added and cleaned off, the navigation light fitted and trim tab outline marked with a triangular file.

The wing tips were cut off 3/16 inch outboard of the aileron, the slit left in the moulding was filled with pieces from the scrap tips, filed to profile and



Spitfire LF IX (Prague Museum).

rounded off. Two underwing radiators were scratch-built from 40 thou plastic card, bent as required, with flaps down, corners filed and sanded to shape, and radiator cores from the spares box. The elevator horn balance was modified, the pieces cut from the tail-plane being glued to the elevator and cleaned up as necessary. Cannons were made up and fitted at the outboard positions, with blisters over the ammunition drums, and .50 calibre Brownings were fitted inboard. The circular rear-view mirror came from the spares box.

A general clean-up and the model was ready for painting, dark green and slate grey camouflage (pattern generally as Airfix kit scheme) top, light grey undersides, duck egg spinner and rear fuselage band ¾ inch wide, and yellow leading edge stripe over outboard half of the wing, all colours matt. To give a slight sheen, a quick rub with one's finger-tip gives some polish! Kit transfers were overpainted to give late-war pattern roundels and fin stripe. A decision on squadron markings was made, before the Duxford boys got busy on Shuttleworth's Spitfire V! You can call it idleness, but the markings are correct, and it does make it easier if all the letters are identical! N from 310 (Czech) Squadron, codes NN. TE565 is a Spitfire LF IXE used post-war, but it has been lovingly restored as late wartime, with a small Czech tri-colour roundel each side below the windscreen. The 'N's were marked out in pencil using a simple celluloid stencil cut with my modelling knife and painted in flat white; the serial was Letraset.

The Czechs are proud of their last Spitfire which is displayed in the National Technical Museum in Prague. I, too, am pleased with my Spitfire conversion for it resides in a place of honour in the Newark Air Museum!

References

Story of a Famous Fighter by Bruce Robertson. (Harborough, 1960); *Classic Aircraft No 1, Spitfire* (Patrick Stephens Ltd, 1971), along with various Aircams and Profiles, give the most information. □

sweden's DRAGON

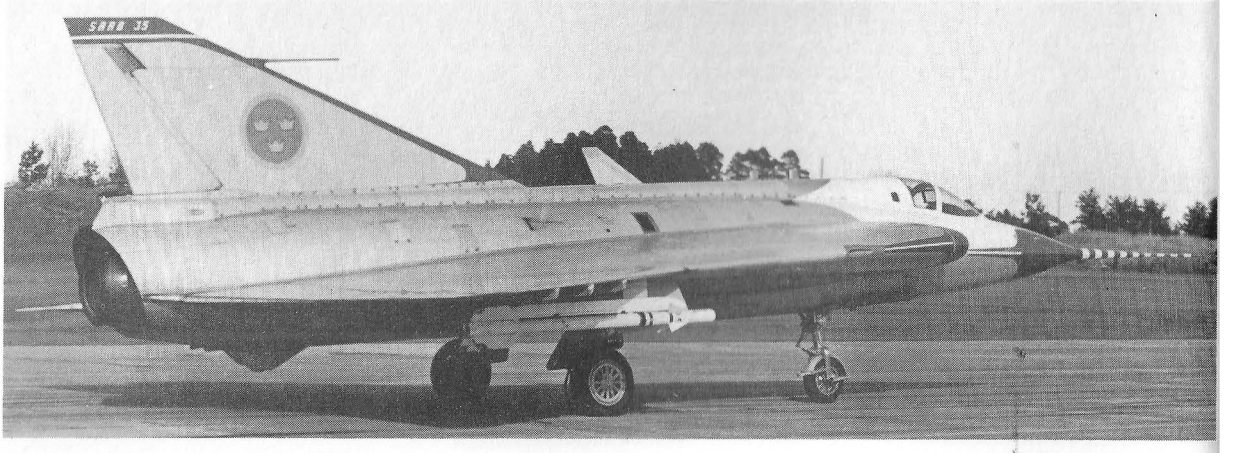
Steve Richards describes the history of the famous 'double-delta' Draken

The Draken story dates back some 30 years to 1949, when the Swedish Air Force — *Flygvapnet* — issued a specification calling for an all-weather, single-seat interceptor, capable of operating from small airfields and auxiliary airstrips formed by sections of Sweden's main highways. It was required that the aircraft should have a maximum speed of around Mach 1.45.

In August of the same year SAAB started work on the Draken (pronounced Drar-ken) project, under the title R1250. It was quickly realised by the SAAB design team, under the direction of Erik Bratt, that a unique wing shape was required to meet the *Flygvapnet* specification. Hence the much discussed 'double delta' evolved. This consisted of two definite triangles, of which the inboard one contained the undercarriage, fuel, cannon armament and the air intake system.

To assist evaluation of the double delta, a small scale development aircraft was built, designated

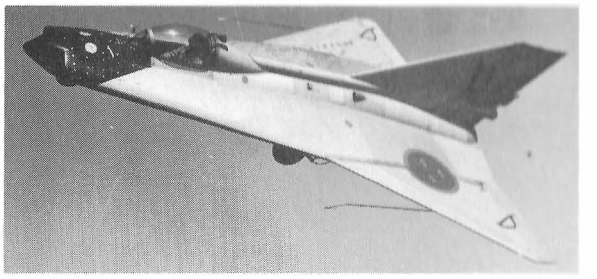
Top of page *A J-35F-2 from F 13 at Malmslatt. Note the infra-red seeker under the nose (J-35Fs without this feature are designated -1), and Falcon missile.* **Below** *The first of the line. The prototype SAAB 35, which was powered by a Rolls-Royce Avon Srs 200, took to the air for the first time on October 25 1955.*

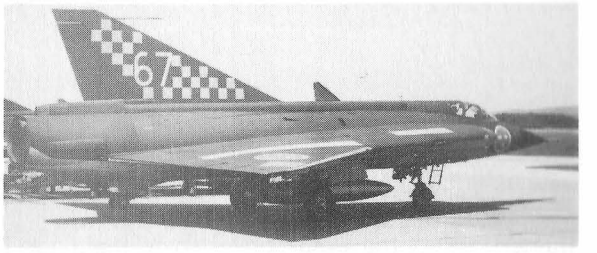


the SAAB 210. It first flew on January 21 1952, and was powered by a 1,050 static thrust Armstrong Siddeley Adder Turbojet. The SAAB 210 was to prove invaluable when studying the low speed characteristics of the double delta.

Meanwhile work on the full size prototype began in December 1951. A contract was awarded to SAAB in 1953, ordering three prototypes and three pre-production machines, plus a nose section for a proposed two-seat trainer version. The powerplant chosen was the unreheated Rolls-Royce Avon Srs 200. On October 25 1955 the first Draken prototype took to the air, going supersonic three months later. The second and third prototypes made their initial flights early the following year.

Level flight speeds of Mach 1.4 were attained by these aircraft, prior to the flight of the first pre-production Draken, which differed from the prototype in that it was powered by the *Svenska Flygmotor* Avon Srs 200 (licence-built Rolls-Royce Avon) known as the RM-6B. This powerplant included the Swedish SFA Model 65 afterburner. The RM-6B turbojet was rated at 11,250 st and 15,190 st with afterburner, and enabled the maximum level speed to be raised to Mach 1.8 (well in excess of the original specification). This pre-production machine, which first flew on February 15 1958, was designated the SAAB J-35A, and was the first of the Draken family to enter service with the Royal Swedish Air Force.





Top *One of the few known pictures of the SAAB 210 experimental aircraft in its early configuration, which first flew on January 21 1952.* **Above** *J-35B, call sign '67', serialled 35261. All Swedish Drakens carry a very small five-digit serial in yellow on the rear fuselage, in line with the wing trailing edge. (Although the unit identity of this machine is a mystery, it is known to have become DK-204 of the Finnish AF, when delivered in 1972 as a J-35BS.)*

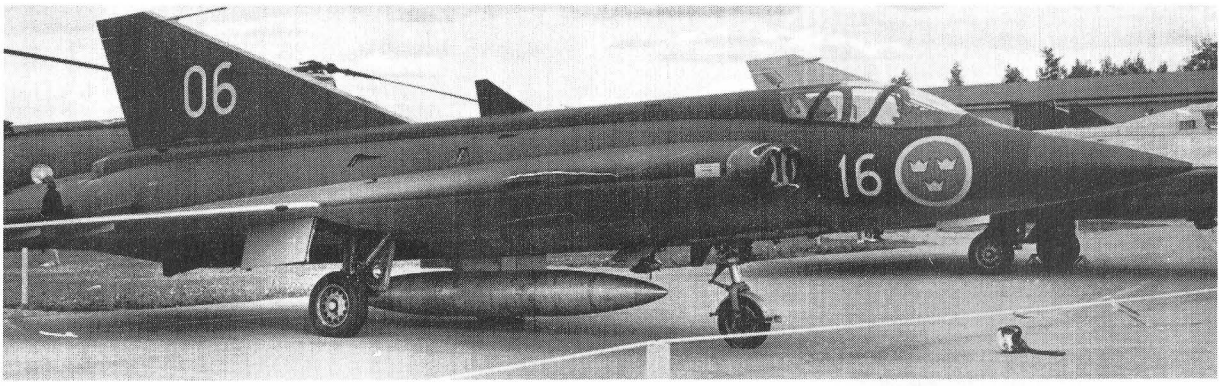
Draken development

SAAB J-35A. Initially this version was similar to the pre-production aircraft, though from the 63rd production aircraft onwards the model 65 afterburner was replaced by the model 66 variant, which increased the overall length of the aircraft by 2 feet 6¼ inches.

Armament and control systems for the J-35A were quite basic. This comprised of the S 6B fire control system, a plain intercept radar, built under licence by L. M. Ericsson, and offering search, lock-on and break away modes only, a Lear basic altitude-holding autopilot for conventional lead pursuit attack, and a pair of 30 mm Aden M/55 cannon with 90 rounds per gun, being mounted inboard of the break in the leading edge. The latter were later supplemented by four Rb-324 (Sidewinder) infra-red homing air-to-air missiles. Internal fuel capacity was 493 Imperial gallons. Although this could be increased by the addition of external tanks, and wing tanks in place of the cannon armament for ferry purposes, the J-35A only carried one external belly tank operationally.

First deliveries of the J-35A Draken went to F 13 Wing at Norrkoping in March 1960, and within a year the wing had completed conversion from the

A fine action shot of an Sk-35C.



J-29 'Flying Barrel'. F 16 based at Uppsala was next. By summer 1964 all J-35As in use with F 13 had been converted to either J-35B or Sk 35C (two-seat trainer), whilst the wing converted to the J-35D. F 16 took on the J-35B after only a short spell with the 'A', some of the latter going to the Draken conversion unit, also based at Uppsala.

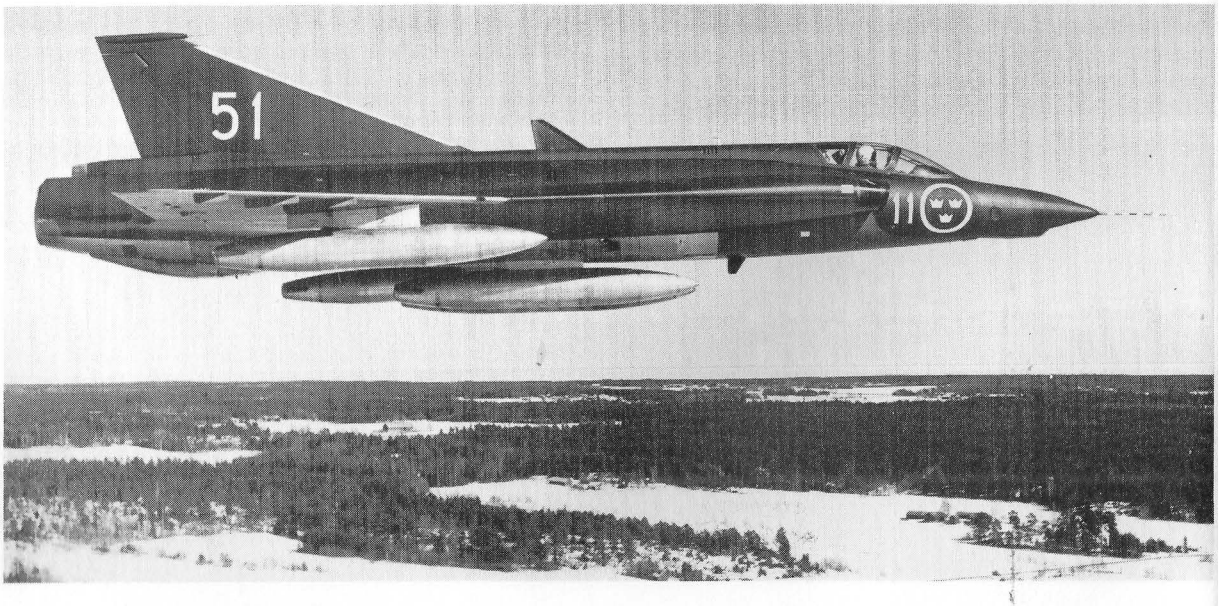
SAAB J-35B. Essentially a J-35A, this type first flew on November 29 1959. The main differences between the two were the installation of the Saab S7 collision course gun sight and fire control system (in place of the J-35A's S 6B equipment) and provision for alternative external loads such as two Saab rocket launchers, each housing 19 75 mm Bofors rockets, nine 220 lb bombs or four 550 lb bombs. As previously mentioned F 16 at Uppsala received the J-35B in 1961, and was the first wing to do so, whilst F 18 at Tullinge began converting to the type during the following year. It was this wing which formed the famed 'Acro Delta' aerobatic team of the early 1960s using the J-35B.

SAAB Sk-35C. The two-seat training variant which first flew on December 30 1959, was a conversion from the early production J-35A, retaining the original short tail pipe (housing the model 65 afterburner).

Despite the new forward fuselage and extra large canopy, the modification had little effect on the original performance, though of course no armament was installed. The instructor was seated above and behind the student, the former using a periscope sight for landing. The relatively few (22) Sk-35Cs that were delivered went to the OCU as part of F 16 at Uppsala, where some remain in use today.

SAAB J-35D. This version of the Draken utilised the RM-6C engine (a licence-built Rolls-Royce RB-146 Srs 300) with an SFA model 67 afterburner, and thus obtained a higher performance over previous versions, that of Mach 2.0 plus. In order to accommodate the more powerful engine, some

Seen against a typical wintry background, this S-35E from F 11 is an early production model of the reconnaissance variant, as it retains the cockpit quarterlights, deleted in later production models.



Left *A few J-35As remain in use with the conversion unit based at Uppsala, and carry the resident's wing number on the nose. Note the short tail pipe, housing the Model 65 afterburner* (G. Henriksson). **Right** *A J-35D, call sign '42', of F 21, prepares to leave its hard standing at Lulea in June 1969* (G. Henriksson).

modification was necessary, including the lengthening of the air intakes, a useful recognition feature. The internal fuel capacity was raised, whilst the Lear auto pilot was replaced by the Saab FH-5 system. Ground level ejector seats were also fitted for the first time.

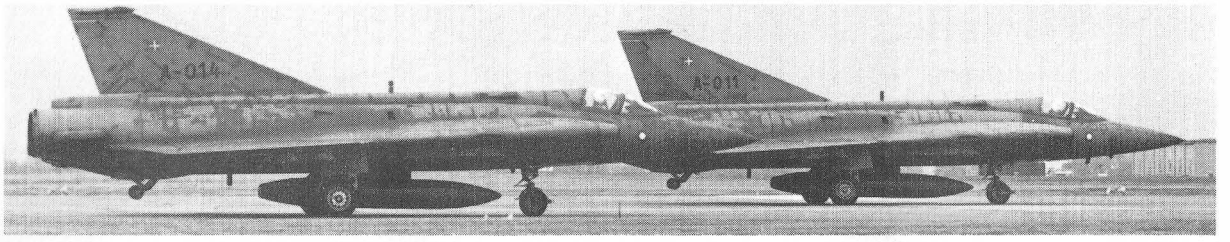
The prototype J-35D was a converted J-35A, and was first flown on December 27 1960, production beginning in the autumn of 1962. A number of 'A' and 'B' aircraft were also believed to have been brought up to 'D' standard. F 13 at Norrkoping was the first recipient of the J-35D, completing conversion in early 1964. F 3 at Malmslatt and F 10 at Angelholm followed. F 10, which received the Draken first, was to progress to the J-35F, but F 3 retained the J-35 'David' until the wing disbanded in 1976.

The J-35D is still in service with the *Flygvapnet,* currently equipping three squadrons of F 4 Wing at Ostersund, and one squadron belonging to F 21 at Lulea.

SAAB S-35E. Essentially a reconnaissance version of the J-35D, the S-35E was to feature a new nose in which four oblique and one forward looking camera were housed. The nose cone was designed to slide forward on rails, to enable rapid access to film magazines and cameras. The two wing bays normally occupied by the wing cannon were also fitted with cameras, one in each bay. The S-35E also incorporated the new blown cockpit hood, designed for the J-35F, with which it shared the Saab production line, in the mid-1960s.

The S-35E first flew on June 27 1963, and entered service two years later in August 1965 with F 11 at Nykoping, where the type still serves alongside a squadron of S-32C Lansen recce aircraft. The other wing to receive the S-35E was F 21 at Lulea, where one squadron was equipped, and today serves alongside a squadron of J-35Ds and one of Sk-60s (Saab 105). This squadron was the first to employ the familiar olive drab/dark blue grey/light blue

Pictured with ground crew at Tullinge in August 1970, a J-35F-2 of F 10 Wing. The chequerboard is dayglo red, whilst the call sign '50' and Wing number '10' are yellow in the usual fashion (G. Henriksson).



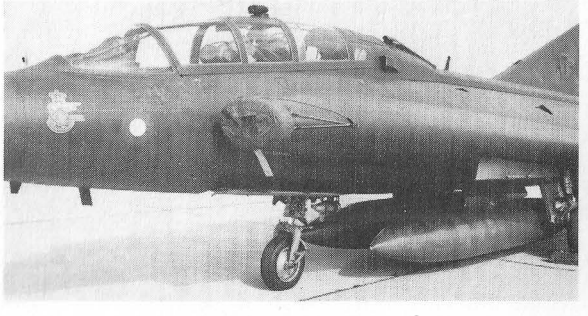
Two RDAF F-35XDs (A-014 and A-011) from 725 Squadron, seen during a visit to Cottesmore in 1973. Note tatty paintwork, which is very prone to oil stains and weathering (S. G. Richards).

grey colour scheme.

SAAB J-35F. Without doubt the J-35F can be considered the ultimate in Draken development. In the mid-1960s Sweden's air surveillance and operational control system, known as STRIL 60, was amongst the best in Europe. However, until the advent of the J-35F, the aircraft which the system controlled lacked, under certain conditions, the effectiveness the system deserved, ie, the J-35A, 'B' and 'D' variants relied upon Sidewinder missiles, cannon and rocket armament. The Sidewinder air-to-air missile cannot be used in some weather conditions, and is only really effective in a pursuit course attack (ie, from a rear quarter), and cannon and rocket attacks also have obvious disadvantages in poor visibility.

It was in 1959 that the Swedish Air Force decided to procure the Falcon air-to-air missile, as primary armament for the later version of Draken. The Falcon system permits missiles to be launched at greater distances than the Sidewinder, and enables targets to be attacked from all directions (collision course attack) under all conditions of altitude, light and visibility even when subjected to some ECM interference. Two types of Falcon missile were decided upon, both being built under licence by Saab, and referred to as the Rb 27 and Rb 28. The former has an active radar which guides the missile to the target, a direct hit not being necessary, as a proximity fuze detonates the warhead when the missile passes within a specified distance of the target. The shrapnel effect is quite devastating. The Rb 28 has an infra-red seeker and homes on to the hot parts of the target.

Far more potent than the Swedish Sk-35C, the TF-35XD as used by the RDAF retains most of the F-35XD's capabilities. Seen here is AT-152 of 725 Squadron. Note the small degree of clearance between the belly fuel tanks and the ground! (S. G. Richards).



It was decided that the STRIL 60/Falcon/Draken combination would provide the Swedes with an excellent defensive system capable of seeing them into the 1980s. Obviously the Draken was to require some redesign in order to accommodate the Falcon missiles and this included the following: the radar altered to allow attacks from greater ranges, and resist ECM interference; the modification of the fire control system; the addition of an infra-red search unit for use against low flying aircraft (also as alternative means of attacking targets in conditions unfavourable to radar); and the inclusion of a blown cockpit hood. The Falcon-equipped Draken, designated J-35F, retained one of its two cannons, and also the facility to carry bombs and rockets on underwing pylons.

The J-35F was to be armed with four Falcons, two Rb27s on the inboard pylons, most effective against high targets, and two Rb 28 Falcons on the wing pylons, with their infra-red target seekers for missions at lower altitudes. A truly all-weather system. The first two J-35Fs were converted 'D' models, and first flew in their new guise in early 1961. Many months of testing with the Falcon system followed, and first deliveries were to F 13 at Norrkoping in 1965.

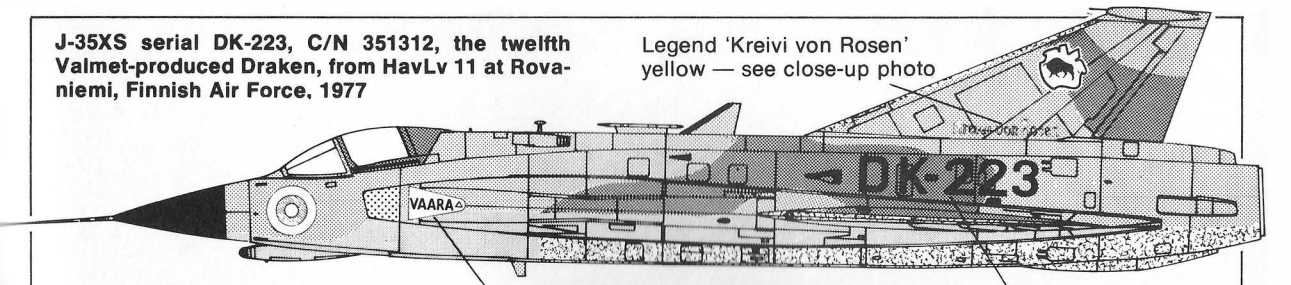
The J-35F was destined to be built in larger numbers than any other variant (208), and is now serving with F 1 (two squadrons) at Vasteras, F 10 (three squadrons) at Angelholm, F 12 (two squadrons) at Kalmar, F 13 (two squadrons) now at Malmslatt, F 16 (two squadrons) at Uppsala and F 17 (two squadrons) at Ronneby.

Swedish Drakens in the 1980s

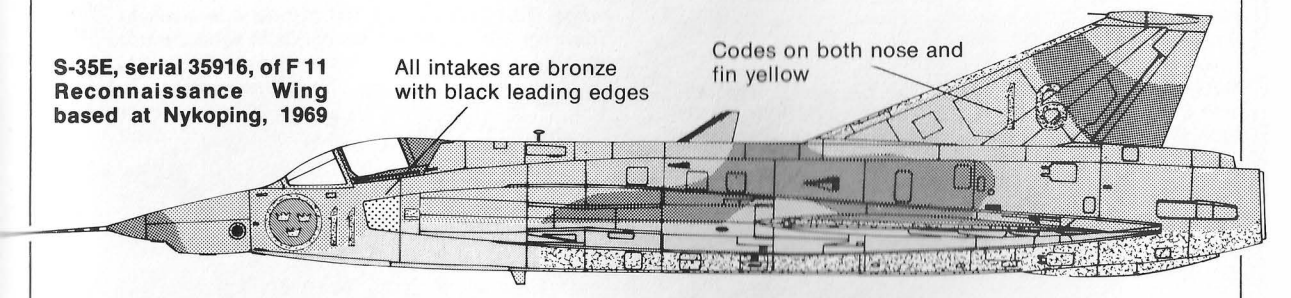
With a total of 17 interceptor J-35D/F and two S-35E squadrons still in use in 1978, the Draken force in conjunction with STRIL 60 is still the *Flygvapnet's* predominant strength. However, as this article goes to press, F 11 (S-32C Lansens and S-35E Drakens), and F 12 (J-35Fs) are due to disband whilst the S-35Es with F 21 at Lulea are in the process of being replaced by the SF-37 Viggen.

With scheduled disbandments and replacement by the Viggen, it is expected that the Draken force will be reduced to fewer than ten squadrons by the

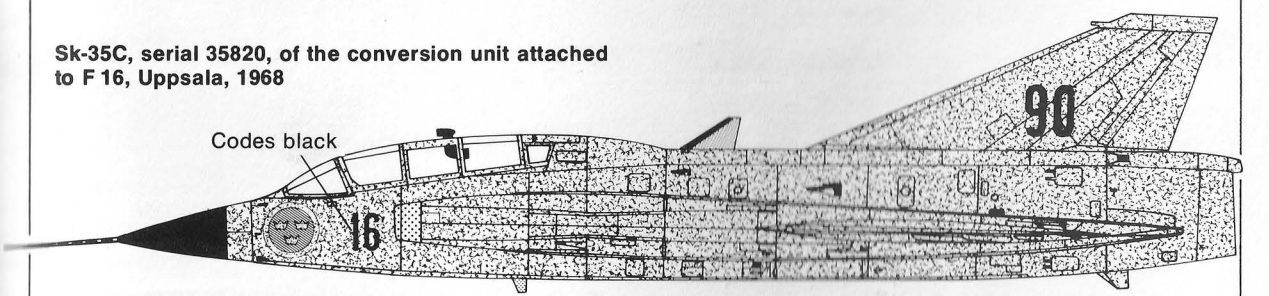
J-35XS serial DK-223, C/N 351312, the twelfth Valmet-produced Draken, from HavLv 11 at Rovaniemi, Finnish Air Force, 1977


Legend 'Kreivi von Rosen' yellow — see close-up photo
DK-223
VAARA
'VAARA' — probably a danger warning and therefore would be red on white
Code black

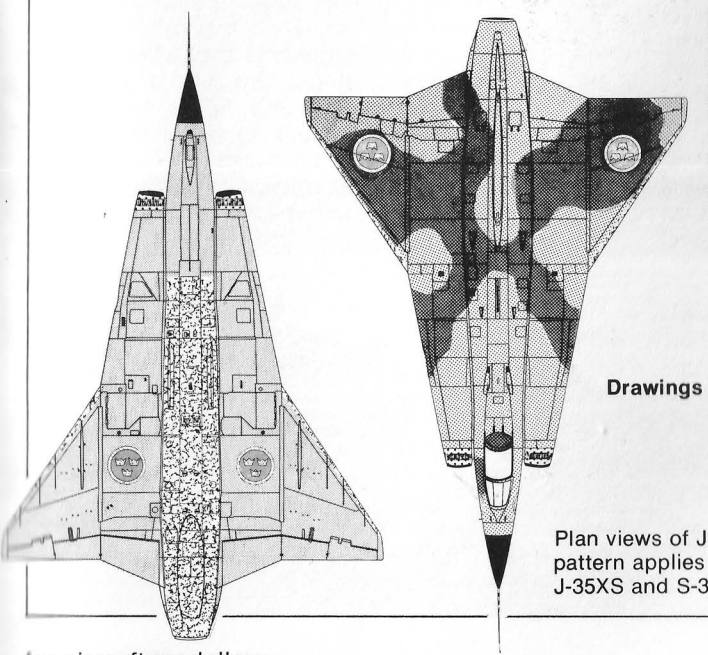
S-35E, serial 35916, of F 11 Reconnaissance Wing based at Nykoping, 1969



Sk-35C, serial 35820, of the conversion unit attached to F 16, Uppsala, 1968

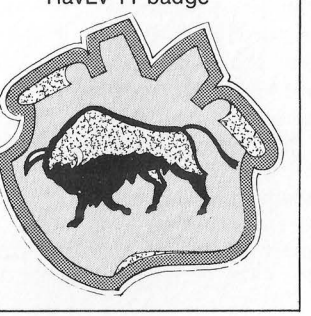


Dark blue-grey Dark green Silver Light blue-grey



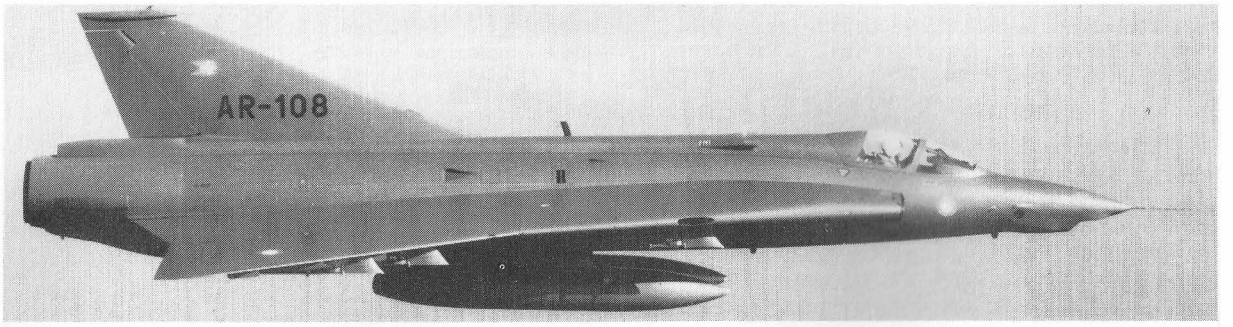
Detail colouring common to all three aircraft — grey cockpit interior, wing and fin leading edges natural metal, black leading edge to dorsal fin, whilst the J-35XS and Sk-35C have black radomes. The nose probe is coloured black and yellow. On all aircraft the national insignia is carried in six positions. The Swedish insignia is a blue disc outlined in yellow, with three yellow crowns, and the Finnish is a white and pale blue roundel.

HavLv 11 badge



Drawings by A. D. Annis

Plan views of J-35F, same pattern applies to both J-35XS and S-35E

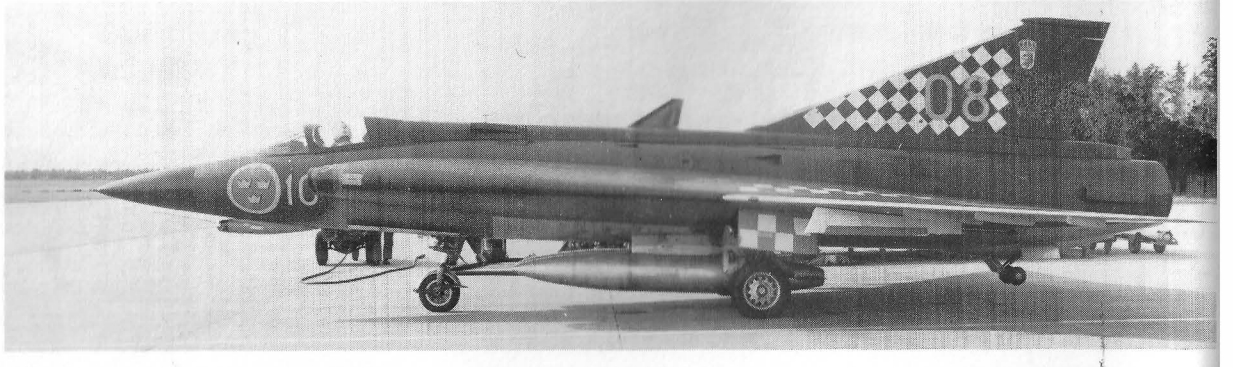


Above *AR-108, an RF-35XD currently serving with 729 Squadron, RDAF.* **Below** *An early shot of the first Finnish-built J-35S, serial DK-201, in an overall natural metal finish. Introduced to replace the Folland Gnat, Finnish Drakens serve with HavLv 11.* **Foot of page** *This J-35F from F 10 carries chequerboard markings on the fin and wings. This feature is used during exercises to identify 'friend or foe', and consists of 20 cm square pieces of tape which are either dayglo red or yellow. This particular aircraft, serialled 35588, has the yellow version* (G. Henriksson). **Right** *One of the six J-35BS Drakens leased by the Finnish AF in 1972 and subsequently purchased.*

early 1980s, when the Draken will no longer be referred to as a front line aircraft.

Sweden is a difficult country to defend, from the ice and snow of the sparsely populated north, to the industrial south. Being neutral Sweden is defending herself from the Russians in the north, and the NATO countries in the south, jealously guarding her long sea frontier on the Baltic and its exit straits opposite Denmark.

With such large areas of desolate land masses, dispersal of Sweden's defences has always been a problem. In addition to its main bases, some of which have hillside or underground rock hangars, there are over 400 sections of Swedish road which are available as airstrips in times of an emergency. The Draken's almost STOL-like capability for a Mach 2.0 fighter has proved that this method of dispersal is practical. The Viggen is also capable of using the same facilities. The *Flygvapnet* has the road scheme so well organised that when a local authority is contemplating a new road or improvement scheme, it asks the Air Force whether it requires an airstrip in the locality. If so it is ensured that the new construction will incorporate a straight and level stretch suitable for aircraft operations. Aircraft parking strips are then added at the roadside by the Air Force.

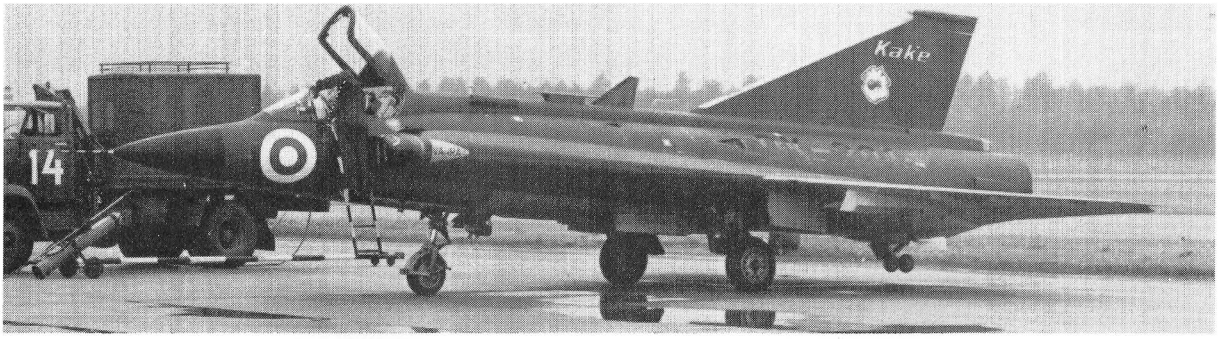


Export Drakens

Denmark. The Saab 35X was developed for the export market. Although externally similar to the J-35F, the export version was designed to possess a superior attack capability and range. In 1968-69 the Danish Defence Ministry ordered 46 Saab 35XDs (D=Danish) Drakens, comprising 20 F-35 (fighter-bombers), 20 RF-35 (recce version similar nose to the S-35E) and six TF-35 (twin-seaters). A further five TF-35s were ordered in 1973.

The first of the Danish orders (an F-35) flew on October 31 1969, serialled A-001. It was delivered to the RDAF on January 29 1970, followed by A-002, 003 and 004 on September 1 1970. Danish Drakens first went to 725 Squadron replacing the F-100 Super Sabres in the fighter-bomber role, whilst the RF-35s were delivered to 729 Squadron replacing the RF-84F Thunderflashes.

725 Squadron has been established at Karup Air Base for many years, being joined by 729 Squadron when the Draken became available. As each squadron has been allocated a number of twin-seaters, the entire RDAF Draken force is currently based at Karup.



Above *Another shot of DK-201, this time as it appeared at the Helsinki Air Show in August 1977, sporting camouflage and black serial. Note the inexplicable absence of IR seeker under the nose* (S. R. P. Thomson). **Left** *A close-up of the tail of J-35XS DK-223 (see drawings). Note the legend 'Kreivi von Rosen'* (S. R. P. Thomson). **Foot of page** *Eighth of the Valmet-produced Drakens, DK-215 has its serial painted white like the J-35BSs, while some J-35Cs have the serial in black* (via R. A. Walker).

Danish Drakens appear to have alternative designations, ie, F-35=A-35XD (serials commence with an A prefix), RF-35=S-35XD (serials commence with an 'AR' prefix) and TF-35=SK-35XD (serials commence with an 'AT' prefix). All Danish Drakens are finished in an overall drab green scheme, with mini national insignia and black serial on fin. The green paint work is very prone to weathering.

Finland. In April 1970 Finland ordered 12 Saab 35XSs (S=Suomi or Finland). These were built by Valmet in Finland, and were delivered to the Finnish Air Force during 1974-75. Unlike the Danish aircraft, Finnish-built machines include the infrared seeker under the nose, and were delivered to HavLv 11 at Rovaniemi, a fighter/bomber squadron covering the defence of Northern Finland. The first Valmet aircraft to be delivered was DK-201 on April 25 1974, subsequent deliveries were serialled DK-203, 205 and all odd numbers through to DK-223.

For familiarisation the Finns leased six ex-Swedish Air Force J-35B Drakens. These entered service with the Finnish Air Force in 1972, and were designated J-35BS. In April 1976 they were purchased, and a further nine ex-Swedish AF machines were also obtained, comprising six J-35Fs and three Sk-35Cs. The arrival of the twin-seaters has meant that training can now be carried out in Finland, whereas it had been undertaken previously in Sweden. The J-35BS aircraft are serialled DK-202 plus all even numbers through to DK-212. As yet it is unclear how the J-35Fs have been serialled, and the one publicised Sk-35C has been allotted DK-264. These aircraft retain their Swedish AF colour scheme. The Valmet aircraft are also painted similarly, although there is evidence that DK-201 was initially delivered in natural metal.

SAAB J-35H. In 1960 a single J-35A (serial 35011) was modified for evaluation by the Swiss Air Force, as a potential Vampire replacement. In the event the Mirage 111 was chosen.

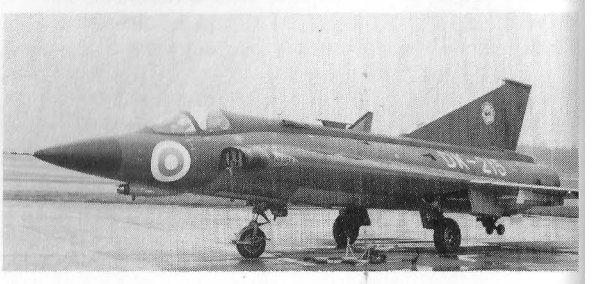
Draken production

Three prototypes with Saab numbers 35.1 to 35.3

Sweden
90 J-35A serials 35001 to 35090
89 J-35B serials 35201 to 35289
22 Sk-35C serials 35801 to 35822 (reserialled J-35As)
92 J-35D serials 35301 to 35392
60 S-35E serials 35901 to 35960
208 J-35F serials 35401 to 35608

Denmark
20 F-35XD serials A-001 to A-020
20 RF-35XD serials AR-101 to AR-120
11 TF-35XD serials AT-151 to AT-161

Finland
Valmet-built aircraft: 12 J-35S serialled with odd numbers DK-201 to DK-223; six J-35BS, six J-35Fs and three Sk-35Cs, all ex-Swedish AF. □



SULTAN OF OMAN'S AIR FORCE

Mike Gething shows how an excellent 'theme' collection can be assembled from available models

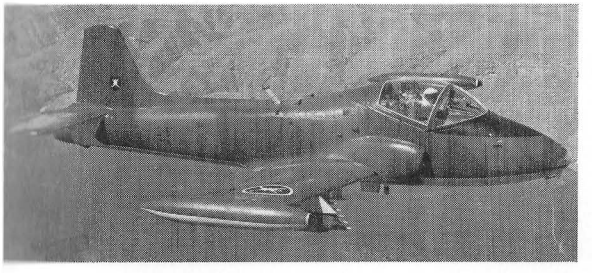
The Sultan of Oman's Air Force came into being in 1958 following a request to the British Government for assistance in modernising the forces following an insurrection. The first aircraft for the embryo SOAF came from the RAF at Khormaksar, Aden — two ex-78 Squadron Scottish Aviation Pioneer CC 1 utility transports. Three armed Hunting Provost T 52s followed shortly afterwards for use in the counter-insurgency role and then two more Provosts and a Pioneer were acquired and these formed the basis of the SOAF until the purchase of four DHC-2 Beavers from the Army Air Corps. The main base is just outside the capital, Muscat, and technical support and maintenance is provided by Airwork Services.

It was the formation of the Dhofar Liberation Front in 1965 in the southern province of Oman, and their subsequent guerrilla activity, that led to the expansion and increase in efficiency of SOAF. Four BAC 167 Strikemaster Mk 82 light strike aircraft were ordered in May 1967, followed by a further three in April 1968 and another five in October 1968. The ex-RAF staging post at Salalah became the centre of operations against the dissidents in Dhofar, and to support the detachments, a refurbished Douglas C-47 Dakota was acquired in 1968. The need for an effective and larger air transport organisation led to six Short Skyvan 3M STOL transports being ordered in 1970, with a further two being added in 1971. Meanwhile two more Dakotas had been acquired, and during 1970 their replacement was selected as the DHC-4 Caribou, and three aircraft ordered.

The helicopter component of SOAF was constituted in 1970 with the initial purchase of eight Agusta-Bell AB 205 Iroquois and four Agusta-Bell AB 206 Jetrangers. A further ten AB 205s and five Bell 214s were later ordered during 1974.

The escalation of the Dhofar guerrilla activity had increased with the open support of the People's Democratic Republic of Yemen, and SOAF expanded to meet the threat. Three refurbished Vickers Viscount 800-series transports were acquired, thus releasing the Caribous for their

Top of page and below *These two shots of SOAF Strikemaster '404' clearly show the aircraft's weapon-carrying capability. Note single pilot's seat on left of cockpit. Colours are dark green/light brown/light aircraft grey with black anti-dazzle panel. Arrow on nose is yellow, national markings and panel on fuselage side red and white. Bombs appear dark grey (probably black) with yellow band, SURA rockets an olive drab shade with yellow bands and natural metal noses. Serial number and Arabic script on fuselage sides is black, blade aerial behind cockpit light aircraft grey with black tip* (BAC).



SOAF AB 205A Iroquois/Huey. Note the winch over the starboard door (Flight).

proper support role, and two more Skyvans were ordered. In November 1971, a further eight Strikemasters were ordered.

During 1972 the Sultan of Oman accepted military assistance offered by Iran, and three IIAF helicopters were deployed into the Dhofar area, followed up by ground forces. Following a raid on Omani territory during November 1973, Iran had guaranteed Omani airspace and the IIAF detached eight F-5As to a new airfield, Midway, in the Dhofar area, and provided anti-aircraft artillery. Other IIAF helicopters deployed at Midway include CH-47s and some AB 205 gunships.

After procuring an additional Beaver and Caribou, plus three Viscount 808s during 1973, the next year produced a bumper crop of orders. In March 1974, a repeat order for six Skyvans was made, and another, for eight Britten-Norman Defenders, was announced; during May BAC received orders for four more Strikemaster Mk 82As, followed the next month by an order for three passenger/cargo convertible BAC One-Elevens with a forward freight door. The final BAC contract was for ten single-seat and two twin-seat Jaguar International strike fighters, and was announced during the SBAC show in September; additionally the BAC Rapier low-level SAM system has also been ordered by Oman. The final batch of orders for 1974 were the helicopters mentioned above and a single Pilatus PC-6B Turbo-Porter.

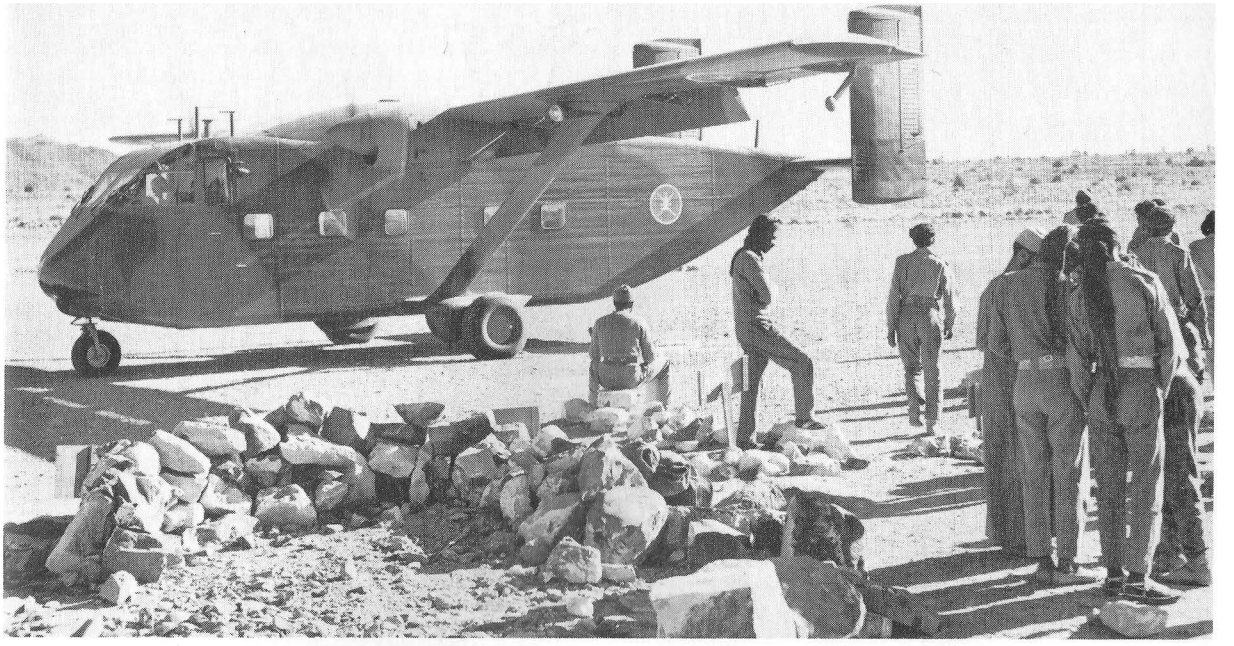
The SOAF expansion programme benefitted in 1975 from King Hussein's failure to transfer the 31 R Jordanian AF Hunters to Rhodesia, when he presented these aircraft to the Sultan of Oman. A Royal Flight was instituted in 1976 and comprises two AS 202/18 Bravo trainers and a single Agusta-Bell AB 212 helicopter.

SOAF today

Running down the squadron organisation of SOAF, the fruits of the expansion programme can be seen. The SOAF played a major part in suppressing the Dhofar rebellion, officially declared over early in 1976. *Flight* reports that the force had lost at least three Strikemasters, two Hunters, at least two AB 205s and an AB 206 in combat up to March 1976.

Squadron organisation

1 Squadron: BAC Strikemaster Mk 82/82A — 12 aircraft on strength, three in reserve, five sold to Singapore, remainder attrited. Based at Salalah. **2 Squadron:** Short Skyvan 3M — 15 aircraft on



SOAF Skyvan, which can carry 22 armed troops or 16 paratroops (Shorts).

strength. Based at Seeb, with detachments to Salalah. **3 Squadron:** Agusta-Bell AB 205 — 16-20 aircraft on strength; Agusta-Bell AB 206 — three aircraft on strength; Bell 214B — five aircraft on strength. Based at Salalah, with detachments elsewhere. **4 Squadron:** BAC One-Eleven Series 475 — three aircraft on strength; Vickers Viscount Series 800 — two aircraft on strength. Based at Seeb. **5 Squadron:** Britten-Norman Defender — eight aircraft on strength. Based at Seeb, with detachments to Salalah. **6 Squadron:** Hawker Hunter (various marks, mainly FGA 73) — 12 aircraft on strength, three in immediate reserve, two attrited, remainder in storage. Based at Thumrayt*. **8 Squadron:** Sepecat Jaguar International — 10 single seat and two twin-seat aircraft on strength. Based at Thumrayt. Due to have been operational and fully equipped by March 1978.

**The retention of the Hunters by SOAF is uncertain after the Jaguar unit is declared operational. Pilot availability will probably be the deciding factor.*

Other units

Royal Flight: AS 202/18 Bravo — two aircraft on strength; Agusta-Bell AB 212 — one aircraft on strength. Based at Seeb (?). **Omani Police Air Wing:** Gates Learjet 25B — one aircraft on strength; Pilatus PC-6B Turbo-Porter — two aircraft on strength. **Flying Training School:** Plans are in hand for an FTS to be formed on the former RAF staging post at Masirah.

SOAF aircraft kit availability

Scottish Aviation Pioneer CC 1 — No kit available; Hunting Provost T 52 — Matchbox — kit gives SOAF option 1:72; DHC-2 Beaver — Airfix 1:72; BAC 167 Strikemaster Mk 82 — Airfix — kit gives SOAF option 1:72; Douglas C-47 Dakota — Airfix —

Right *A SOAF Viscount seen at Hurn in 1974 prior to delivery* (BAC). **Left** *Another view of an SOAF Skyvan clearly showing the camouflage scheme and positions of national markings* (Shorts).

SOAF AB 206 JetRanger (Flight).

convert from AC-47 gunship 1:72; Short Skyvan 3M — Airfix — kit gives SOAF option 1:72; DHC-4 Caribou — No kit available; Agusta-Bell AB 205 — Use Hasegawa UH-1D Iroquois 1:72; Agusta-Bell AB 206 Jetranger — Use Rareplanes vacform kit, if still available 1:72; Vickers Viscount Series 800 — Frog kit may become available in Novo range in the future 1:96; Britten-Norman Defender — Airfix 1:72; BAC One-Eleven Series 475 — Airfix — convert from Series 200 1:144; Sepecat Jaguar International — Airfix, Frog, Matchbox, Heller 1:72 and Heller 1:50; Bell 214B — No kit available; Agusta-Bell 212 — No kit available; Hawker Hunter — Airfix, Frog, Matchbox — twin-seat option in latter kit, or use Air Conversion modification kit with either of the first two 1:72; AS 202/18 Bravo — No kit available.

Modelling and colour notes

Sepecat Jaguar International (SOAF serials: 201-212). For the single seat Jaguar International, the revised Airfix Jaguar GR 1 will serve excellently with virtually no structural modifications. SOAF Jaguars are intended to be used in the air defence role, and to that end will be equipped with overwing pylons to mount two Matra R 550 Magic infra-red homing air-to-air missiles. So far, there have been no official pictures released of SOAF Jaguars with this installation fitted, but the accompanying photograph of the BAC Jaguar International demonstrator fitted with the system should suffice as reference. The pylons are mounted on the location of the overwing fences, with a separate missile launching shoe above that, and then the Magic missile itself. There are not, as yet, any Magic missiles available in 1:72 scale, but it is an easy job to modify a Sidewinder to represent the Magic. The full scale length of the Magic is 9.19 feet compared with 9.32 feet of the Sidewinder, which means the Sidewinder from a kit (say, from the Airfix F-5A) should be cut down, from the rear by 0.6 mm, and the nose and tail fins trimmed accordingly, and the extra nose fins added from plastic sheet.

The two-seat Jaguar is currently available in the Heller 1:72 Jaguar kit, although examples of the Frog Jaguar may still be available (especially if Novo have re-released it again). The accompanying photographs show the first two-seater to be delivered fitted with a drop tank under each wing. If this configuration is preferred, then the Airfix kit tanks can be used.

Both versions of the Jaguar in SOAF service are camouflaged in a 'wrap-around' scheme of Dark Earth and Light Stone. The pattern is almost identical to that used by RAF Jaguars, with the Dark Earth corresponding to the Slate Grey areas and the Light Stone to the Dark Green, which is a reversal of the contrast of the two colours. The underside part of the model is a mirror image of the upper surfaces. The modeller is recommended to paint one band of colour at a time, working aft from the nose.

So far the only national markings carried (or seen) on the Jaguars is the tail fin 'shield' marking and the serial number in Arabic and English on the rear fuselage. Ejection seat warning triangles, no step, rescue and fire extinguisher markings can be used direct from the kit transfer sheet, as they are carried in exactly the same positions. The fin 'shield' comes from the Strikemaster transfer sheet.

Hawker Hunter

F 6 (SOAF serials: 718, 719, 723, 724, 725). Use the Airfix F 6 kit as supplied, although various refinements can be made to this kit. For instance the locating stubs to the wings can be removed and the wings positioned in place without the anhedral that otherwise appears; and the existing kit undercarriage doors, which are much too thick, can be replaced with ones cut from 10 thou plastic sheet.

FR 10 (SOAF serial: 853) Similar to the FGA 9 (FGA 73 detailed below) but fitted with three cameras in the nose, one of which is housed behind 'eye-lids' in the nose cone, which should be rounded off to represent the type.

T 66 (SOAF serials: 800-802). Equating to the T 7 variant of the Hunter, this two-seat trainer version is available in kit form from Matchbox, or the Airfix F 6 or Frog FGA 9 can be converted using the Air Conversion or Airmodel conversion kits.

FGA 73 (SOAF serials include: 815, 817, 825, 831, 842, 844, 849, 851.) Essentially an FGA 9, this version is available in the Matchbox range or in the Frog/Novo range (in line for re-release in due course, we are assured). The Airfix F 6 can be converted to FGA 9/73 standard by adding the brake parachute housing over the rear fuselage/engine exhaust area, as well as carrying out the F 6 improvements already mentioned.

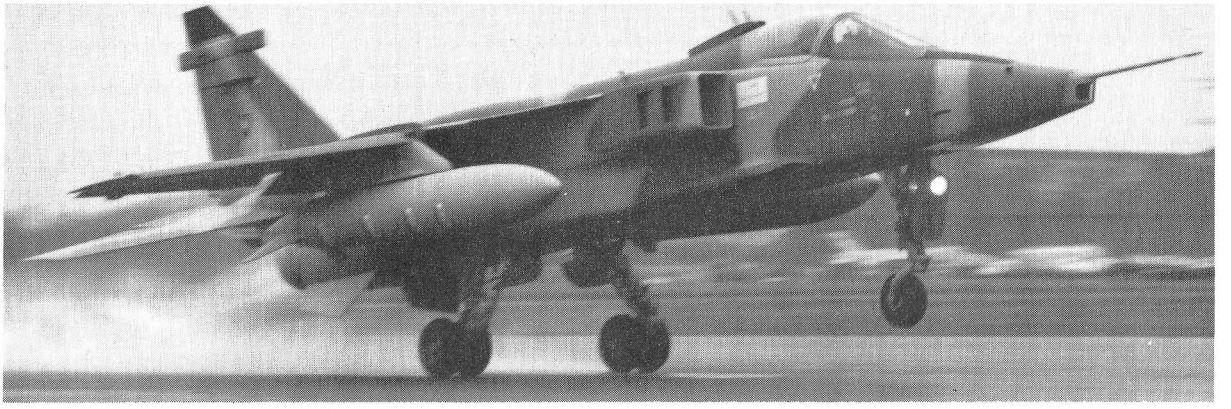
A Britten-Norman Defender in SOAF markings prior to delivery.

As far as can be ascertained, all the Hunters wore the standard Royal Jordanian Air Force scheme of Dark Green (M17), Slate Grey (M2) and Light Aircraft Grey (M13) in a similar camouflage pattern to the RAF's Hunters. The RJordanianAF insignia has been painted out, and the new style SOAF insignia applied. The new insignia has a thin green outer band to the roundel and fin 'shield' replacing the white band, and the white dagger markings have sprouted 'wings' from their cross-over point. Markings and serials can be modified using Strikemaster or Skyvan transfers.

BAC 167 Strikemaster Mk 82 (SOAF serials include: 402, 407, 412, 418, 423.) The Airfix Strikemaster/Jet Provost T 5 kit gives you all you require for a super model of a SOAF Strikemaster, including markings for 412. Matchbox also market a Strikemaster, but not with Omani markings. For that extra detail, the Strikemasters were usually flown from the left-hand seat, with the right-hand ejection seat removed. A typical underwing load would be a 500 lb bomb on the outer wing pylon, with two banks of SURA rockets (lifted from the Matchbox kit) on the inner two wing stations. Four banks of four SURA rockets is the maximum load under each, which could get expensive in Matchbox Strikemasters, but it is possible to cut down the air-to-ground rocket projectiles from the Airfix Hunter F 6 kit into passable substitutes.

The camouflage pattern and colour scheme is as given in the kit instructions: basically Dark Green (M17) and Light Brown (M5) upper surfaces with

A BAC One-Eleven Series 475 with a forward cargo port prior to delivery to the SOAF (BAC).



The first Jaguar International S(O)1 of the Sultan of Oman's AF leaving BAC Military Aircraft Division's aerodrome at Warton on March 7 1977, en route *for Thumrayt in Oman* (BAC).

Light Aircraft Grey (M13) undersurfaces.

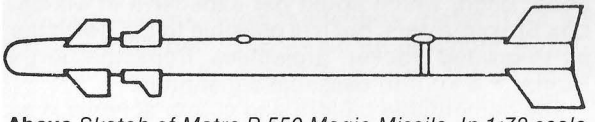
Britten-Norman BN2A-21 Defender (SOAF serials: 301-308 inclusive.) The original Airfix Islander was re-released during 1977 with options for a Defender — which basically meant the provision of underwing pylons and stores and a new transfer sheet. The comments made by Keith Palmer in his article *The Sultan's Defenders* in the August 1975 issue of *Airfix Magazine* are, therefore, still valid. For the benefit of new readers, I will recap these points.

'Since all Defenders for Oman are of the BN2A-21 version with the more powerful 300 hp engines, some changes are required to the cowlings as shown in the drawings. First assemble the engines, except for the propellers and, when the glue has hardened, cut off the air intakes with a razor saw or sharp knife. Fill the resulting hole with plastic card and body putty.

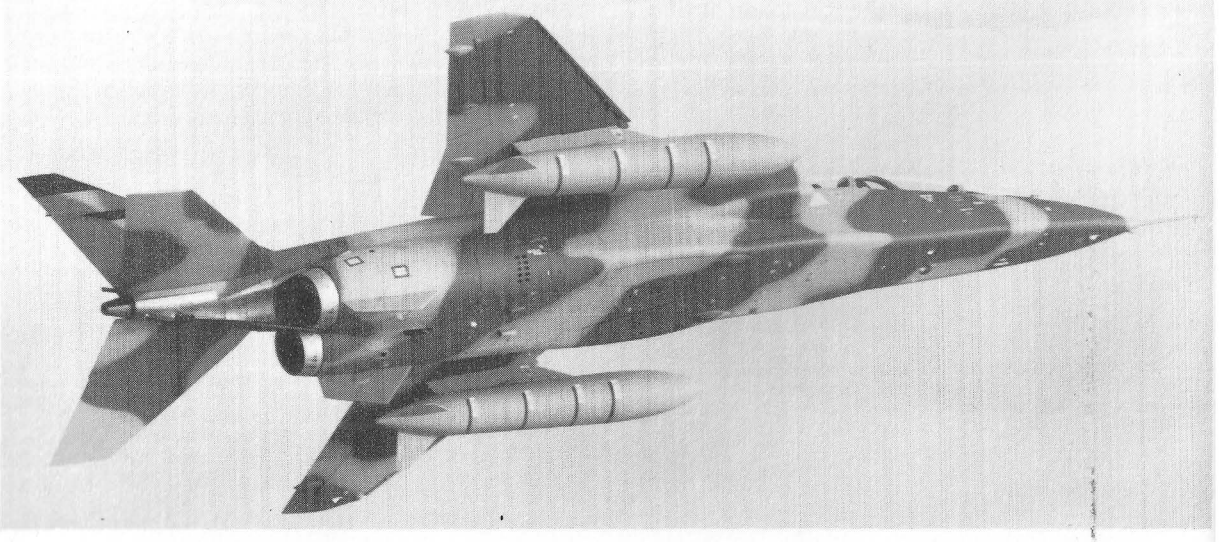
'Extend the [trailing edge of the] cowlings using thin plastic card, and when this has dried, reduce the size of the air intakes and glue back in their new positions. The bulges on the cowling sides should then be built-up using body putty.

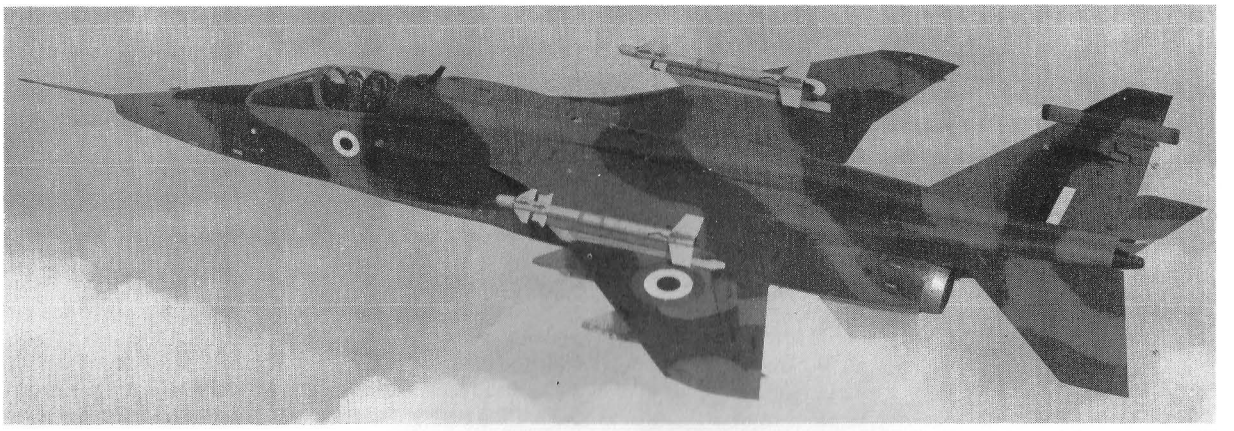
'Due to the comprehensive avionics fitted, quite a number of aerials appear on the outside of the aircraft. Most noticeable is the large white blade aerial which is above the cockpit and slightly off-set to port. Others include two ADF aerials under the fuselage and a wire stretching from above the cockpit to the fin.

'No pylons are carried on the Defenders delivered to Oman . . .'



Above *Sketch of Matra R 550 Magic Missile. In 1:72 scale it would be 38.8 mm in length.* **Below** *Jaguar International B(O)1, the first twin-seat version in desert camouflage, during a proving flight from Warton prior to being delivered to the SOAF. Note the camouflaged under surfaces* (BAC).





Twin Magic 'dog fight' combat missiles seen here fitted to overwing pylons on Jaguar SO 7, flying from BAC's Warton Aerodrome in Lancashire. This fit, coupled with the increased thrust of the Adour-26 engine, provides an advanced air combat capability, and SOAF Jaguars will be so fitted (BAC).

The SOAF Defenders are camouflaged in a 'wrap-around' scheme of Dark Green (M17) and Light Brown (M15). National markings are carried on the normal six positions, with the 'shield' on the fin — use Skyvan markings for the Defender. Serials in Arabic and English are carried just forward of the rear fuselage roundel and inboard of the underwing roundels.

Short Skyvan 3M (SOAF serials: 901-916 inclusive, omitting 904.) The Airfix Skyvan offers a civil variant as well as the SOAF version, so careful attention to the instruction sheet is recommended. The method of construction of the fuselage will enable the super-detail enthusiast to have a field day both in the cockpit and the freight/passenger hold. If crew figures are put on the flight deck, the heads of the military crew should be removed and replaced with bare heads devoid of 'bone-domes' from your spares box.

The Skyvan is camouflaged in a 'wrap-around' scheme of Olive Drab (M21) and Light Brown (M5) as detailed in the kit. Please note that two alternative serial numbers (901 or 907) are supplied so try not to mix serials when applying the transfers. There is also a white roof to the flight deck area on some aircraft, and the propellers are in the new black/white high visibility bands.

Agusta-Bell AB 205A (SOAF serials include 702, 705, 710, 714, 719, 723, 725.) As this helicopter is a licence-built version of the Bell UH-1D Iroquois, the Hasegawa model fits the bill exactly. The kit itself provides an interesting model and includes US Army weapons fit as used in Vietnam. It is not known if SOAF arm their AB 205s, but it is thought unlikely, and therefore, the rocket pods and machine guns should be omitted. Otherwise the kit is built as per instructions, apart from the painting.

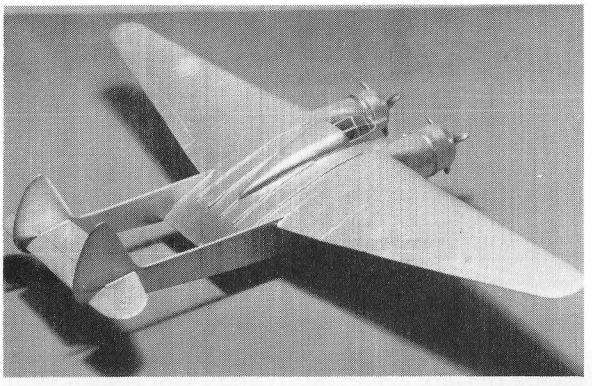
The SOAF AB 205As are camouflaged in irregular bands of Dark Green (M17) and Light Brown (M5), with an '18' in red band across the tail fin with the word 'DANGER' reversed out in white in English with the Arabic characters above. The roundel is on the forward part of the tail boom, and the serial just forward of the boom horizontal stabiliser is black.

Conclusion

By building models of the previously described six aircraft, the main strength of the SOAF can be represented. However, perusal of the list of aircraft kits available will show there is ample scope for further researches on the historical side. Airfix have a DHC-2 Beaver and a C-47 Dakota in their 1:72 range, while the Skyking series of models provides a 1:144 BAC One Eleven, although this will need major surgery to depict a Series 475 version. One of the options in the Matchbox Piston Provost kit is of a SOAF aircraft, while Rareplanes include an AB 206 Jetranger in their range of vac-form kits. The scope is wide, especially if you include some Iranian aircraft that were deployed to Oman in support of the Sultan's forces during the Dhofar Campaign. □

Cunliffe Owen
FLYING WING

Gerald Scarborough undertakes a unique conversion from the Airfix Hampden kit



Kits of aircraft from the 1930s period are few and far between while those of civil aircraft can be counted on the fingers of one hand. One-off development types are not even given a thought by the kit manufacturers for obvious commercial reasons. All of which leaves a vast field open for us odd-ball modellers who don't care what we model so long as it is almost impossible! Neville Franklin's drawing of the one and only Cunliffe Owen OA Mk 1 had been languishing in my files for a year or more, so when the Editor asked if I'd like to do an article for this Annual I dusted it off and said, 'Yes, Ed! I'll do a Hampden conversion'.

First I had better explain what the aircraft is all about. Cunliffe Owen based the design of OA Mk 1 on the American Burnelli machines but with a redesign of the structure. The 'Flying Wing' had its flight trials in 1939 and thus became a casualty of the war in that its production had to be curtailed and what could have been an interesting line of development came to an end.

The basics of the design were to incorporate a lifting, aerofoil section, 'fuselage' which would, or so it was claimed, contribute almost 90 per cent of the lift at maximum speed. The main advantages were that passengers and freight (possibly a bomb load was also visualised) were concentrated near the centre of gravity and that all the main stresses were taken by this thickened central wing section. The outer wings and the tail assembly on twin booms could all be of light construction while engine and undercarriage assembly stresses would all be concentrated again in the centre section. The cabin to seat 15 passengers was wide and roomy with a good view not spoilt by the instrusion of wings or engines. The aircraft could in fact lift its own weight (9,500 lb) and with an all up weight of 19,000 lb the payload would be 4,000 lb with enough fuel and oil aboard for 1,950 miles.

The 'Flying Wing' was the first aircraft to fit the new civil rated Bristol Perseus XIV sleeve valve engines of 900 hp. To these engines was fitted the German VDM fully-controllable and feathering constant-speed, electrically operated airscrews — again the first British aircraft to be so equipped. The cockpit, mounted under a faired canopy above the centre section, accommodated two pilots and gave a good view forward and around as it was well above the two engines.

Ailerons ran from the strut attachment point on the rear spar to the tip with split flaps on the inboard section of the wing. A split flap was also fitted underneath the 'fuselage' centre section. The reversed tricycle undercarriage retracted forwards and all wheels were accessible while the aircraft was airborne should there be any faults.

Performance figures published quoted a maximum speed of 235 mph at 6,000 feet (225 mph at sea level), a cruising speed of 195 mph at 5,000 feet on 62.5 per cent of maximum power and a stalling speed of 67 mph. A service ceiling of 22,000 feet and a range of 1,950 miles or ten hours at 195 mph were useful figures for a prototype model.

My model, as mentioned, was based on the Airfix kit of the Hampden and construction was kept fairly simple with no attempt being made to include interior detail. As is so often the case when you are working on a project the information you are looking for turns up too late — in this case it came to light in an old copy of the *Aeroplane* for May 17 1939. This issue contains an article on the 'Flying Wing' and includes a cutaway drawing showing all the interior seating and the pilot's compartment. I have related these to Neville's drawings and included this arrangement for modellers who may wish for a more detailed interior.

The main parts that will be used from the Hampden kit are the wings, engine cowlings and main wheels but a few of the smaller parts can also be improvised when adding detail. The wing parts are first modified by cutting away all the engine nacelles as close to the wing surface as possible. Retain the cut-away bits for use later. Cut off the lower half

of each wing tip and cement the two pairs of wing halves together including the ailerons which should be cemented in place. When dry, fill all panel lines, aileron joints etc with filler. The gaps left at the engine positions should be filled and I suggest the use of Plastic Padding for these large gaps. When all is dry, 'wet-and-dry' paper, and possibly files at first, should be used to smooth down the wing surfaces and blend in the engine positions to the aerofoil section of the wing. This is quite laborious but if you start with a coarser grade of paper and use plenty of water to keep it clean it is not too bad. When you are happy with the general shape cement a new wing tip half, to give the shape shown on the drawings, underneath the kit wing tip and shape with body filler to the old tip.

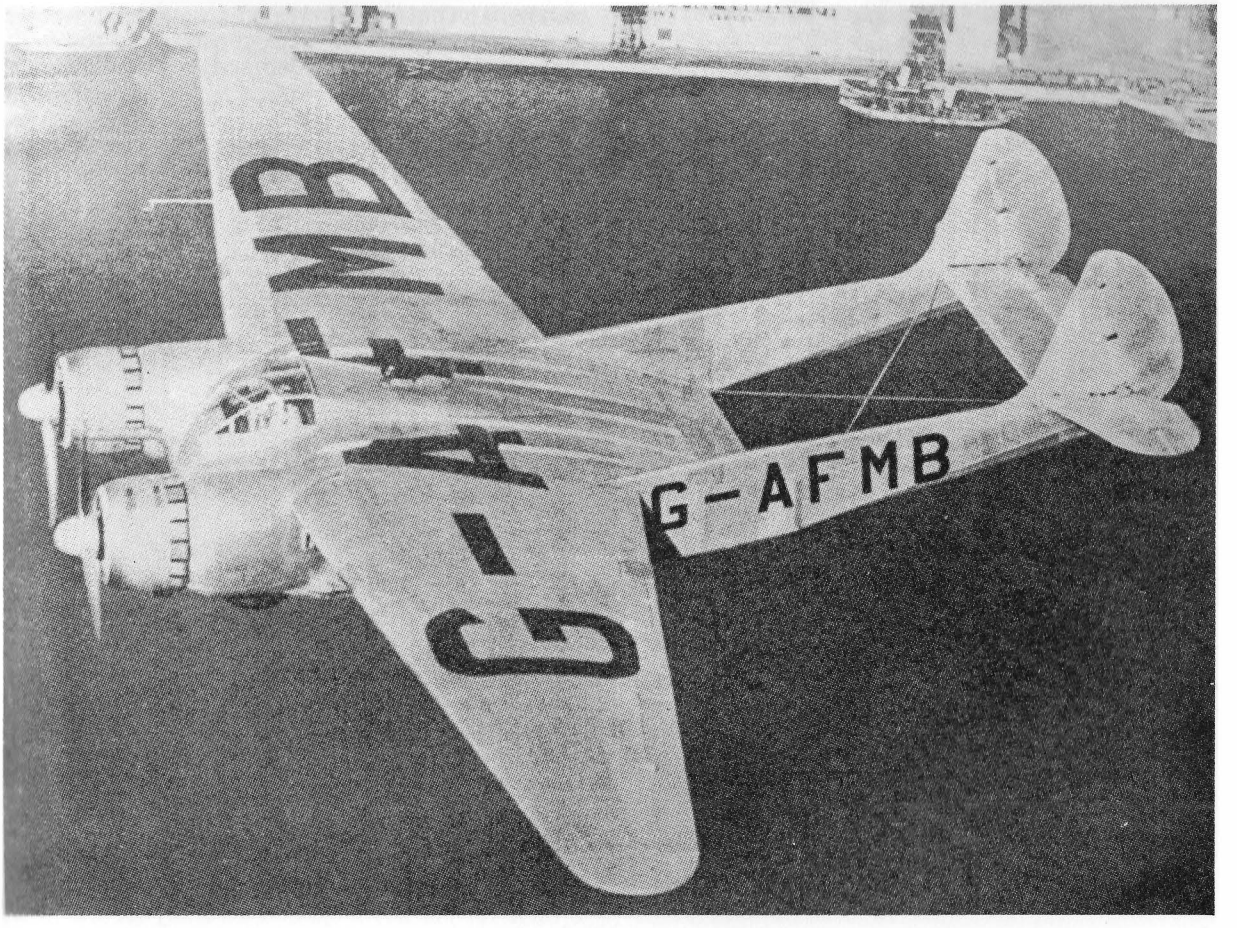
The two wing halves should now be cut accurately to fit the shape on the plan by sawing away approximately 10 mm from the root. Also cut across to incorporate the dihedral on the outer sections and re-cement together after filing to fit. Again, when dry, fill as necessary with body filler and smooth to shape.

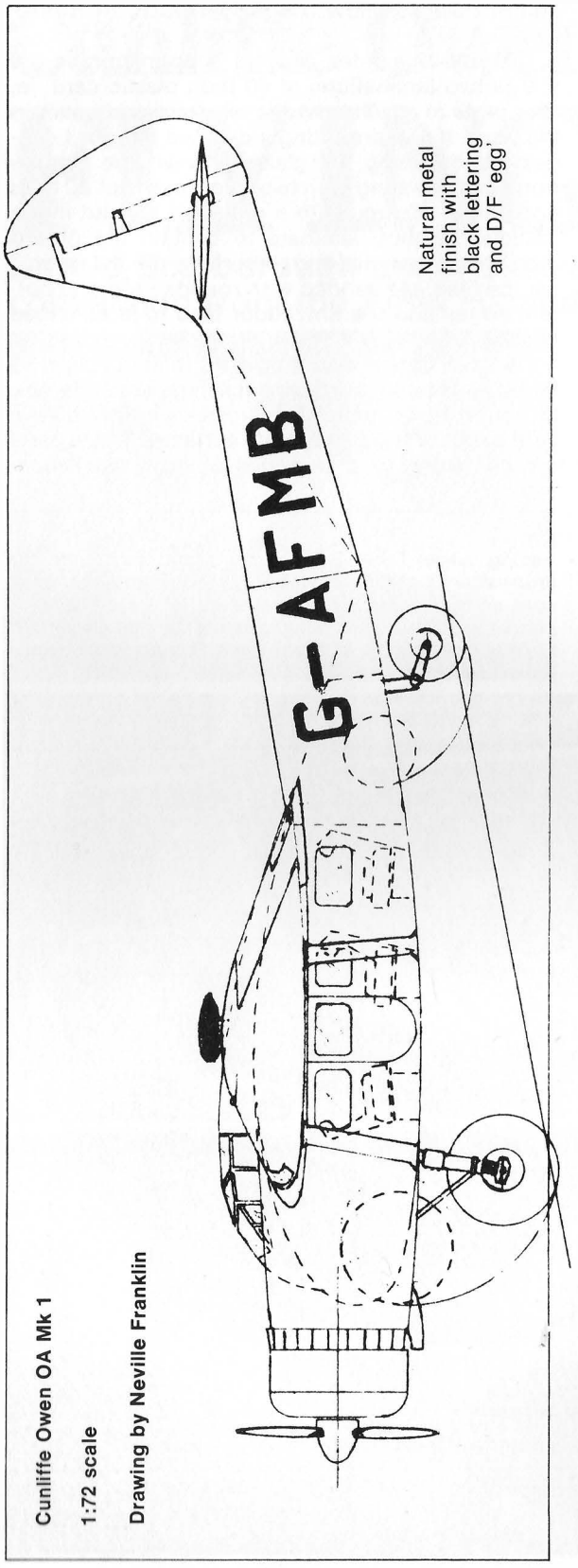
The engine cowlings (Parts 92 and 96) should be shortened by cutting a section out just in front of the gills. The radial engines (Parts 91 and 95) can be fitted inside the cowlings after cutting off the centre boss to allow the propellers to fit further back.

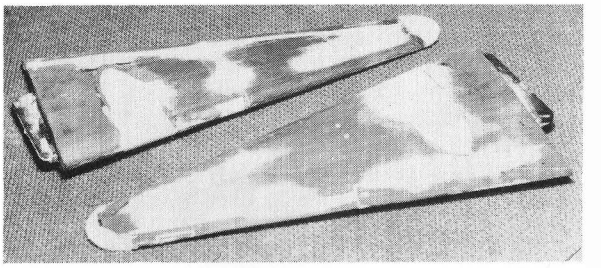
The fuselage sides and tail support booms are cut as two laminations of 40 thou plastic card, ie, four parts in all. Cut out the windows and score in the door. If you are fitting a detailed interior I suggest sandwiching the glaze between the laminations or laminating with two thicknesses of 20 thou and one of 40 thou with a rectangle cut out in the 'middle' 20 thou laminate to contain the glazed area. When cemented together and dry the booms can be filed and sanded with rounded top and bottom edges and the fin/rudder filed to streamlined section.

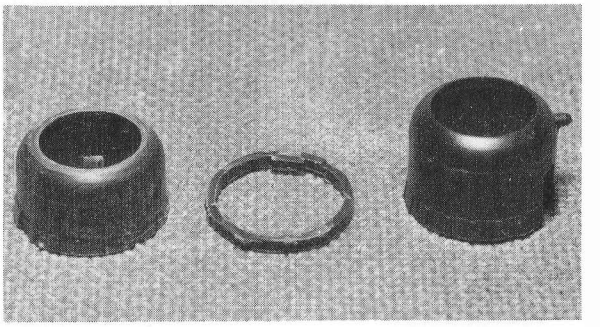
Two parts are now cut from 40 thou plastic card to the aerofoil section of the fuselage but undersize all round by 20 thou, the thickness of the plastic card used for top and bottom surfaces. These parts are cemented to the insides of each side/boom

Facing page *Three-quarter rear view shows off the unusual lines of this aircraft. A rub-down and final paint coat and application of registration letters are still, of course, required at this stage.* **Below** *Cunliffe Owen OA1 G-AFMB prototype in flight over Southampton* (Peter Green collection).

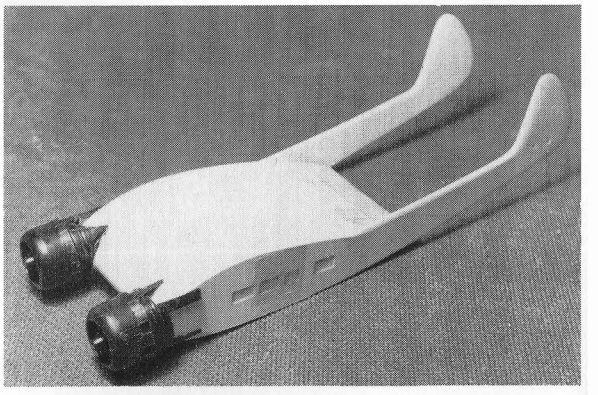






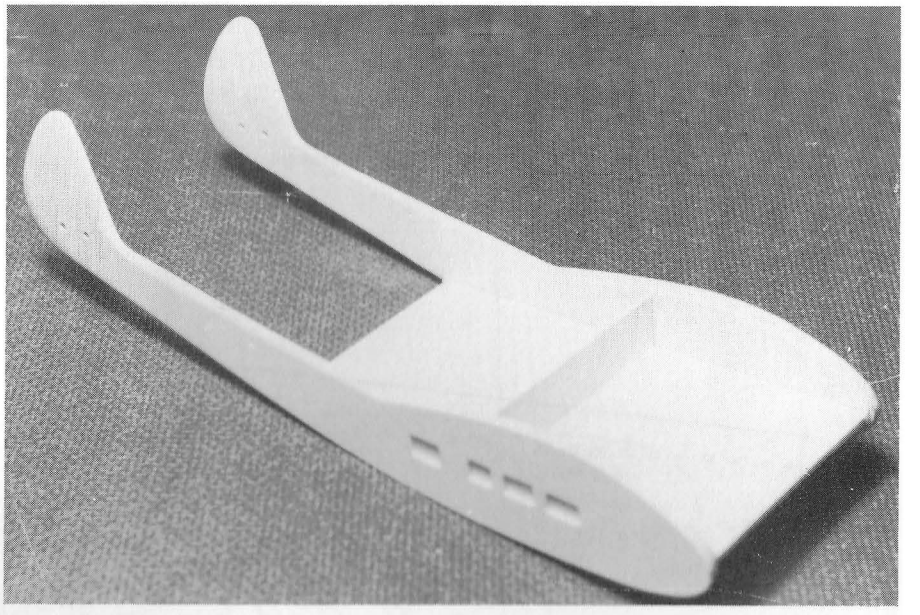


assembly. Bulkheads are now cut to fit between the fuselage sides and, in fact, I fitted a 'floor' with reinforcing bulkheads above and below. All this has to be assembled very accurately so that the booms are parallel and in line from the side view and the nose is square across. The top and bottom to the fuselage centre section is added from a wide strip of 20 thou plastic card starting at the trailing edge and working forward to wrap round the nose and back underneath to the trailing edge again. A little precurving at the nose will assist this operation.



While all this is drying the three tailplane parts can be cut out, filed and sanded to shape and the hinge lines, etc, scored in. Check for fit between tail booms and set aside for assembly later.

The next stage is to build up the engine nacelles and for this use the parts cut from the Hampden wings but turned through 90 degrees. The underside part, with the wheel wells, is used on the outside and the top half used for the inside on the Cunliffe, by cutting away to fit around the nose of the centre section. Really these are only to serve as a base for the cowlings and as a key for the filler,



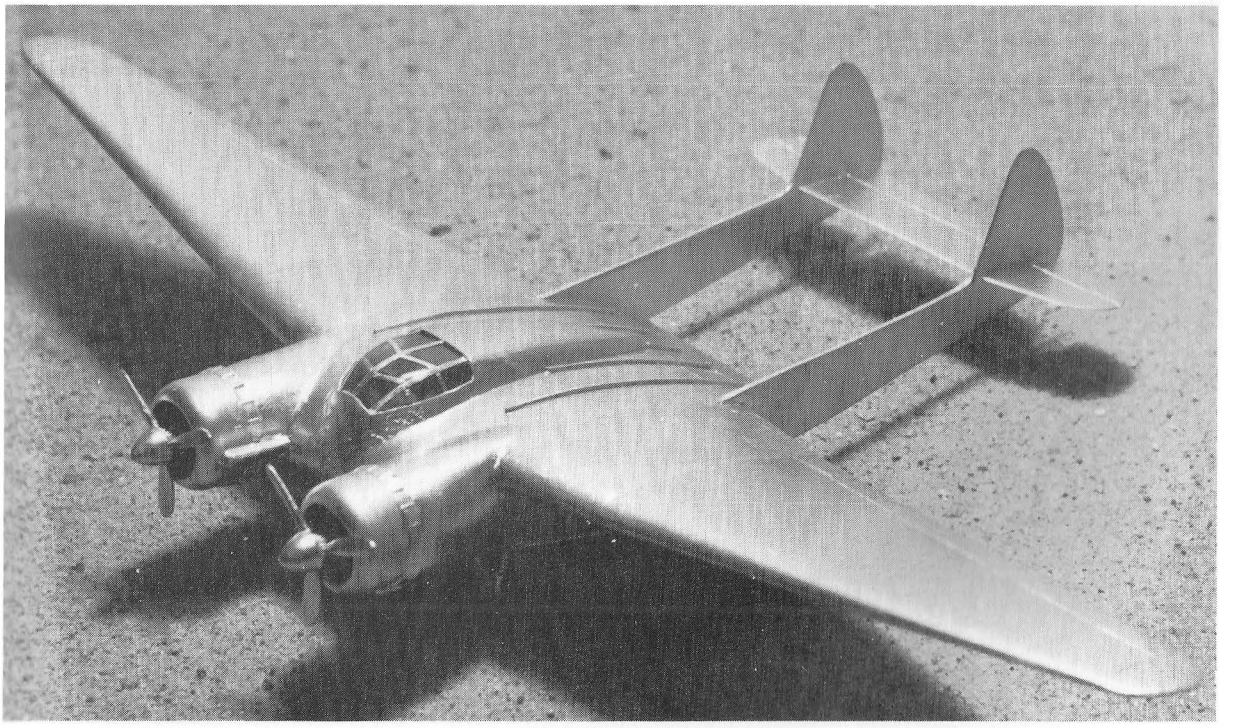
Above left *Airfix Hampden kit wings with nacelles removed and filled ready for final shaping.* **Right** *Booms cut out of laminations of plastic card and sanded to shape are joined by a 'floor' and bulkheads. More than the one bulkhead shown are required both above and below the 'floor'.* **Below left** *Hampden cowlings are modified by removing a section from in front of the cooling gills.* **Bottom left** *The remnants of the nacelles cut from the wings are used as a base for the cowlings.* **Foot of page** *Cockpit in place with framing from Metalskin.*

but of course they must be lined up accurately in plan and side elevations, a job made easier by slipping the cowlings temporarily in place.

The nacelles are now built up using filler and again I used Plastic Padding after scoring the areas to which it is applied. Pushing it well into the scrap nacelles helps to key it all in place and, if you have mixed it correctly, it can be filed to shape after 10 to 15 minutes. You may have a few holes and gaps to fill in after but the basic shape can soon be filed up and then finished off with 'wet-and-dry'. Carve away to allow the leading edge of the wing root to fit neatly up to the fuselage but before fitting the wings cut out the cockpit area.

The wings can now be cemented in place ensuring that the top surface fits flush with the top deck of the centre section and that the dihedral is as shown on the plan. When dry fill any gaps and cracks and sand smooth. At this stage it is a good idea to apply an undercoat of matt white to seal the areas of filler ready for the top coat of silver.

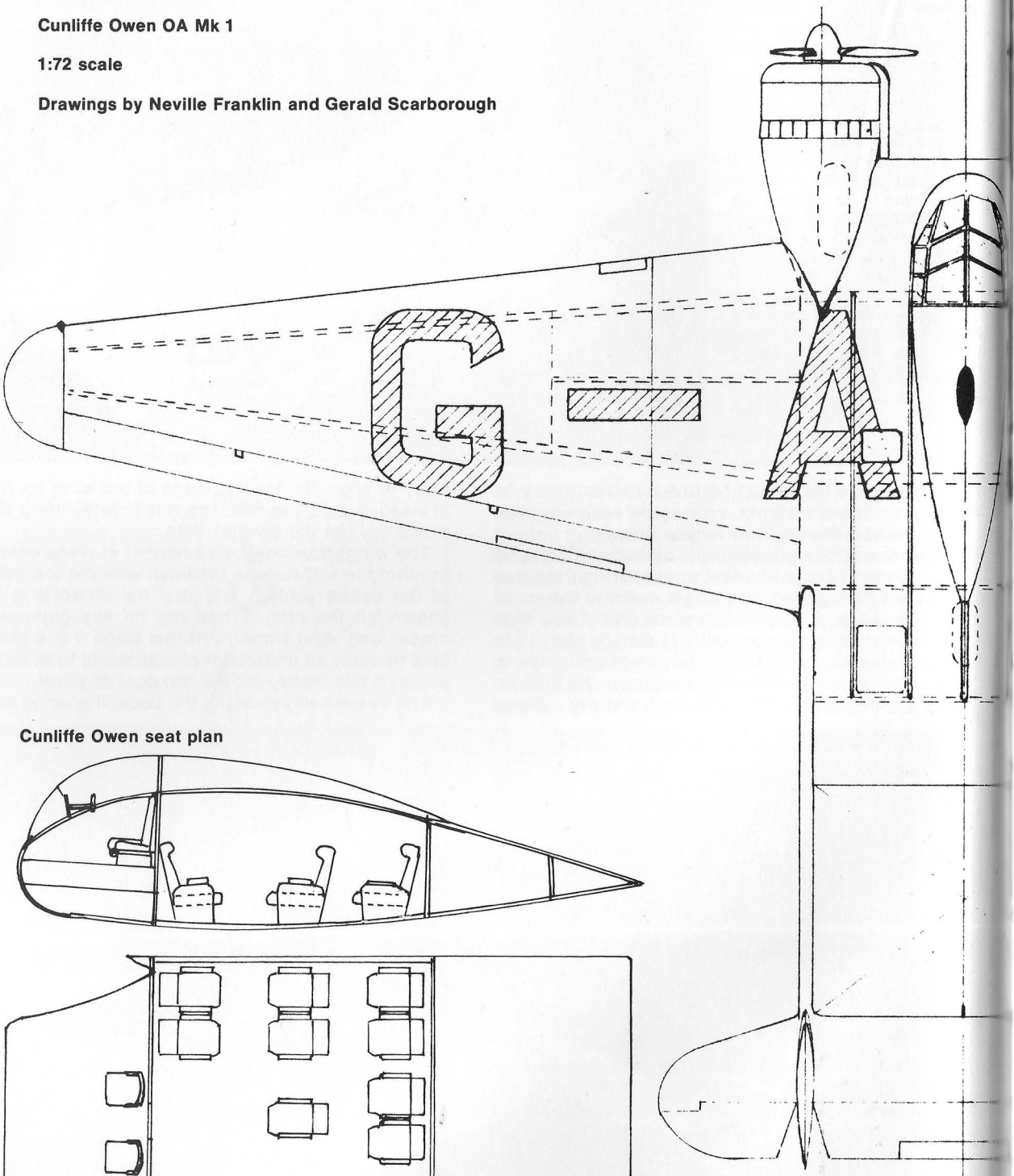
The easiest way to make the cockpit glazing and



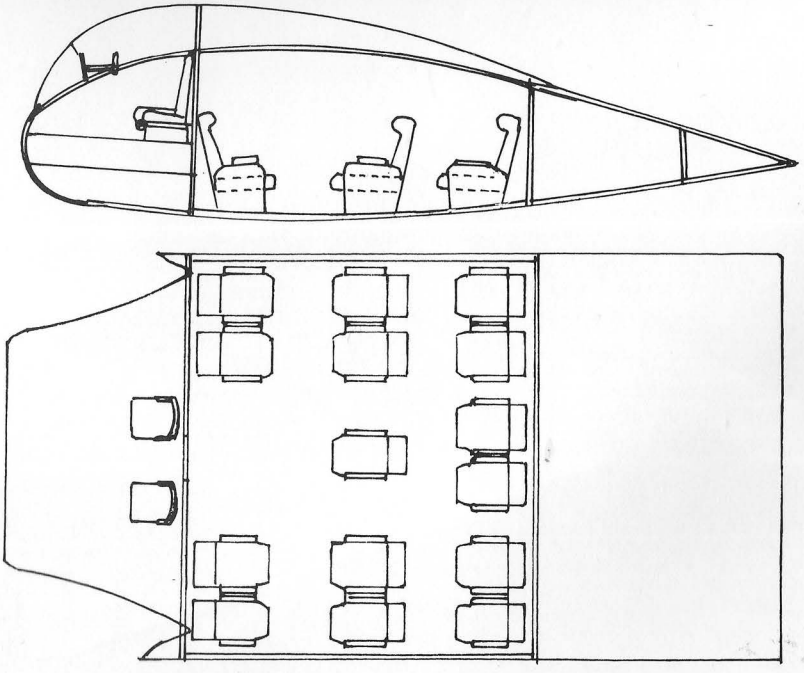
Cunliffe Owen OA Mk 1

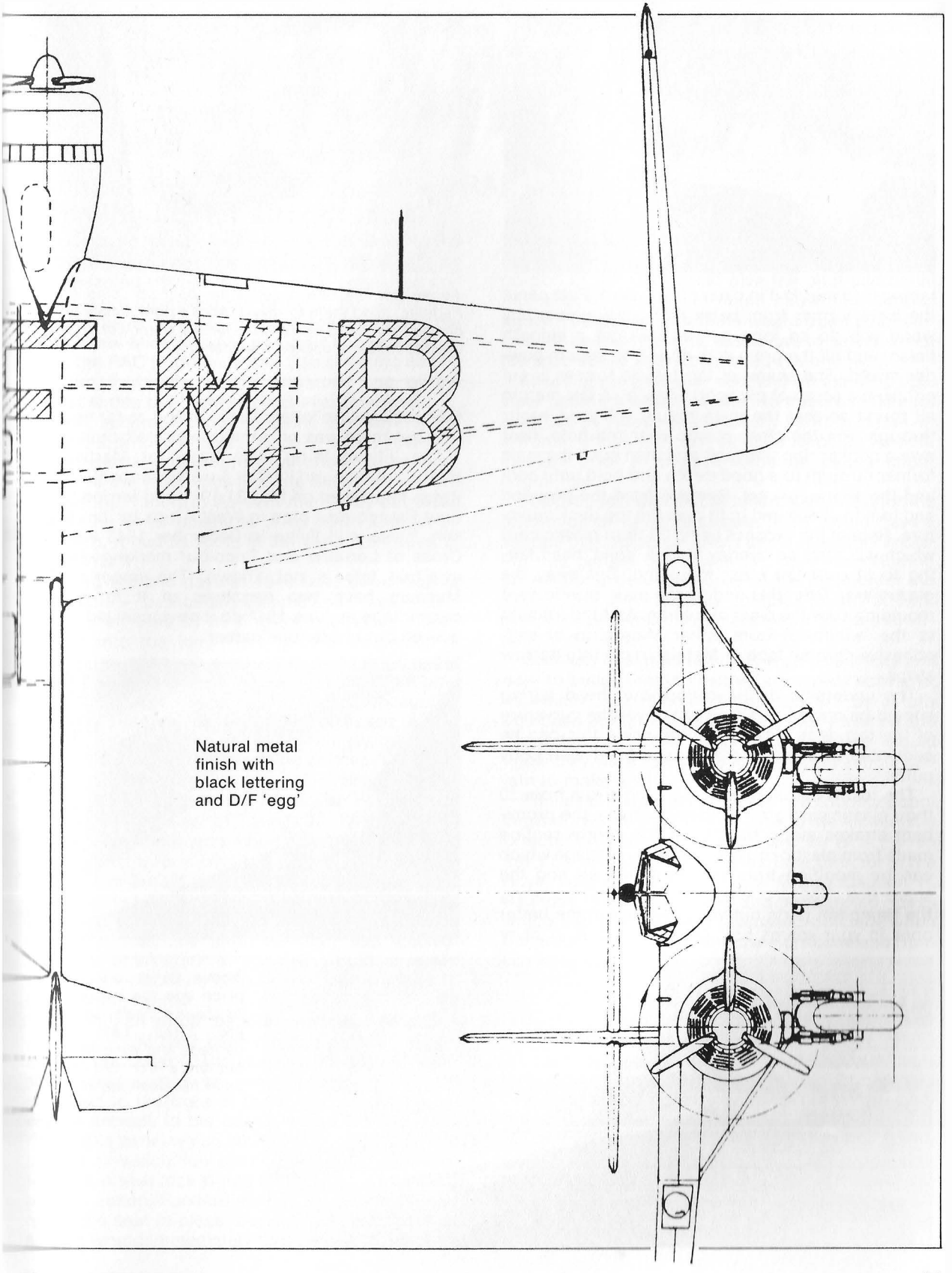
1:72 scale

Drawings by Neville Franklin and Gerald Scarborough

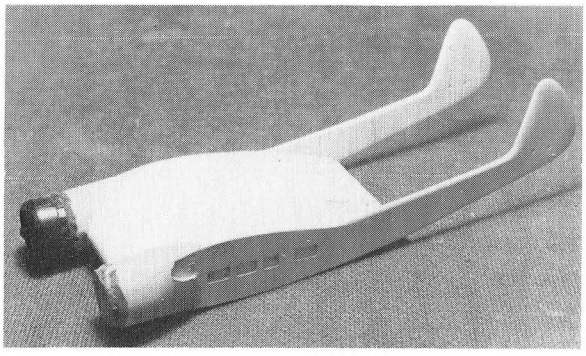


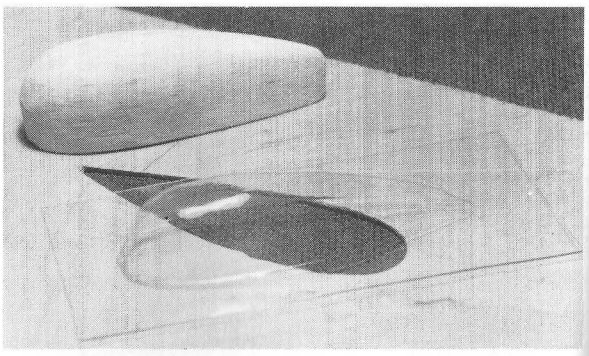
Cunliffe Owen seat plan





Natural metal finish with black lettering and D/F 'egg'





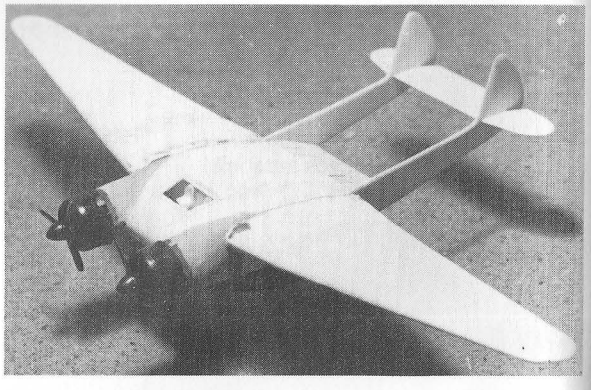
Above left *The new nacelles are built up using Plastic Padding, filing them to shape.* **Above right** *A male former carved from balsa wood and a female shape cut in ply are used to mould a cockpit transparency.*

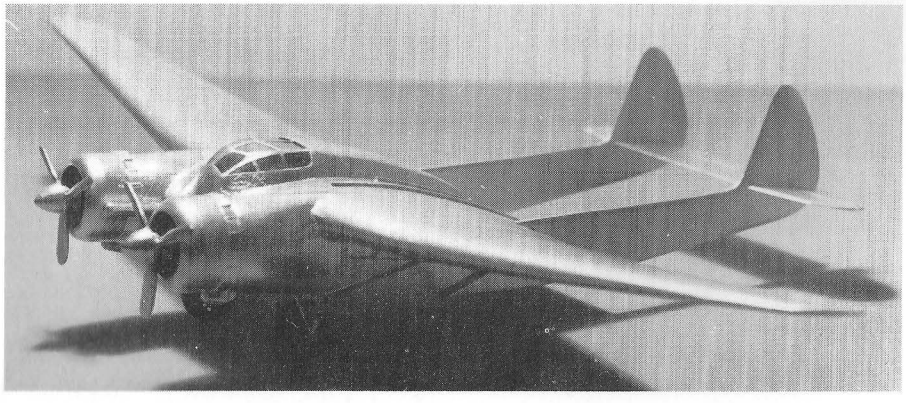
fairing is to mould it in clear plastic card. First carve the male former from balsa (although almost any wood will do so long as you can get a smooth finish) and fill the grain with dope and talcum powder mixed. The shape of the female former is cut out from a scrap of plywood allowing a fair margin all round so that the male mould will pass easily through. Pin the clear plastic over the hole, heat over a cooker ring until soft and then push the male former through to a good depth and hold until cool and the shape has set. Remove from the plywood and trim to shape and tc fit over the top deck curvature. Repeat the process using 20 thou plastic card which will form an overlay for the 'solid' head fairing to fit over the clear moulding. Cut away the glazed area from this and fit the plain plastic card moulding over the clear moulding. Add the framing to the 'windows' from either Microstrip or self-adhesive chrome tape or Metalskin cut into narrow strips.

The underside of the canopy-cum-head fairing should be carved and filed to fit over the curvature of the top deck. After painting inside this can be cemented in place and any gaps filled with body putty.

The rest is detailing with the wing struts from 30 thou plastic card strip sanded to shape, the prominent strakes along the top of the centre section made from plastic rod and the undercarriage which can be modified from the Hampden kit and the scrap box. The propellers were shaped up using the Hampden parts but you may have some better ones in your spares box. Overall finish is in silver with registration letters in black and as far as I can find out there was only the one aircraft built.

The 'Flying Wing' was based at Martlesham Heath and received its C of A on November 27 1940. It was impressed on May 31 1941 and ferried to the Free French Air Force in West Africa by Jim Mollison. It was still flying in December 1943 with the Cross of Lorraine and Tricolour markings but its eventual fate is not known. The Imperial War Museum have two negatives of it in military camouflage in June 1941 so it obviously led a chequered but mysterious career. □





Above *Wings are now in place and the cockpit area has been cut away and seats, etc, fitted.* **Left** *Undercarriage and wing struts fitted and a first coat of silver paint has been applied.*

RAMMERS

Michael J. F. Bowyer describes RAF wartime ramming fighter aircraft ideas

Assorted and novel schemes were submitted to the British Government throughout World War 2 by well-meaning citizens. Many were ill-conceived and others were dismissed out of hand, but a few wild notions were actually tried; these included the Long Aerial Mine (or LAM, cynically known as 'Mutton'), the PAC (Parachute and Cable) spring device and the Turbinlite, which produced one of the eeriest sights the night sky has ever tolerated.

Such schemes brought scant comfort to the defended, whose only real hope of safety rested in airborne radar and ground controlled interception.

One of the least known of the exotic ideas concerned the 'rammer'. As with many way-out ideas employing an aeroplane to bring down another by ramming, it had its roots in the aerial collisions of World War 1.

During the bad days of 1940 tales abounded of how pilots — particularly Czechs and Poles — sacrificed their lives by hurling themselves and their aircraft into the foe. There is little substance in these tales, although some pilots on both sides did occasionally ram their enemy. The custom-built rammer, though, remained an untried concept.

Official interest in the idea increased a few months before the war began. Previously, there had been discussion of the ramming concept at the Air Ministry. A British inventor, Mr I. Shamah, proposed such a craft to the Phillips & Powis Co of Reading at the start of May 1939. Where design theory was concerned he had done his homework, and devised a form of pilot ejection seat, an item untested in Britain until 1944.

He claimed Patent No 8566 for his idea, proposing a light high-speed monoplane which could ram an enemy machine after the pilot had ejected. Shamah envisaged a specially built aircraft, although his notions could have been wedded to any existing fighter.

The cockpit would be sited well aft. The pilot's controls would have been strangely placed to one side of the cockpit. His seat was to be built on a strong frame held on runners located on bars extended to the front of the aircraft, probably the engine firewall. In the fuselage side was an easily removable panel which could be opened by a cable release, or which flew open as the pilot's seat shot forward. A seat lock would be released by the pilot prior to action. Forward normal momentum would retain the seat in place, but collision with another aircraft would immediately hurl it forward, ejecting the pilot to safety through, it was envisaged, the open hatch. A small spring fitted into the upright portion of the seat would give the pilot additional momentum, although it could cause him serious injury. The pilot's parachute would open automatically or by hand, and he would fall to safety whilst his specialised aircraft rammed the enemy.

Ahead of the propeller hub, and on the wing tips, steel rammers would be sited to ensure maximum destruction. Attack would ideally be from astern. In a frontal attack the pilot would escape by forcible ejection prior to impact, although debris might engulf him.

The proposal was that rammers were ideal for the protection of valuable targets. They would have a serious psychological effect upon an enemy knowing that certain death was his even after eluding conventional defences. Loss of one rammer for the destruction of a relatively complex enemy aircraft seemed worthwhile. Rammers might be normal aircraft in disguise.

Specially designed rammers would be cheap and easy to build, needing neither armament nor radio, especially if a rammer flight was led by a fully equipped fighter. Pilots could be easily trained and needed no gunnery experience. Civilians would know they were safeguarded by aircraft almost certain to make a kill.

Phillips & Powis, ever open to revolutionary concepts, forwarded the suggestions to the Air Ministry Director of Technical Development, Mr W. S. Farren (later Sir William Farren and wartime Director of the Royal Aircraft Establishment). Group Captain R. Saundby examined them and recognised ideas which had already been discussed officially when the projects which became the Hurricane and Spitfire were under review.

Technically the ideas were acceptable, but tactical implications needed consideration. The Air Staff saw the problem of fighter defence as one of being able to destroy as many enemy aircraft as possible with available resources without overcomplication. The question was — would rammers or conventional fighters achieve the highest kill rate for cost effectiveness?

The rammer seemed certain to achieve a high success rate. Standard .303-inch rounds needed to hit vital parts to be effective. Cannon with lower fire rates would need very accurate aiming. Use of rammers simplified maintenance and removed repair problems following combat.

Against this, every rammer used effectively would inevitably be lost, whereas it was estimated in 1939 that interceptor fighter losses would be about one in 20 of those operated. It would be difficult for the pilot to estimate the impact speed needed, and there could be no ramming practice, only highly risky trials. Rammers might be lost after inflicting insufficient damage on the enemy. As the rammer closed it would present an easy target to a gunner. Re-gathering rammer pilots after combat was complicated, especially for rapid re-deployment.

On balance, though, the rammer was an attractive device, yet if sufficient fighters could be produced rammers might be a costly venture, and the aircraft had only one role. Unarmed, they would be vulnerable in air-to-air combat, although a rammer might achieve success after damage even if the pilot was wounded. Whereas the efficiency of a standard fighter in combat was set at about 50 per cent the rammer looked likely to have a 90 per cent chance of making a kill.

Of most concern was the high wastage rate, assessed for a normal fighter as one per 45 sorties. A fighter squadron was expected to mount a hundred sorties weekly and thus lose about two aircraft. If a rammer squadron successfully intercepted on even half its weekly sorties a squadron would lose getting on for 50 aircraft, apart from normal wastage. Thus, rammer losses would be over 20 times greater than those of normal fighters, which meant that 20 times as many rammers would be needed. To produce as much success as one conventional fighter about 11 rammers would be needed, thus the cost of 11 rammers needed to equal that of one conventional fighter.

In early June 1939 rammers had been dismissed for the present. A rammer force might destroy about 45 bombers per 100 sorties, a highly attractive total when compared with conventional fighters claiming 25 in the same period. To achieve this rammers needed to close range to nil in the face of return fire. If armour could be applied effectively to a rammer, it could also be fitted to a heavy fighter. The latter could then close range to fire with a heavy cannon most effectively. On June 14 1939 the Air Council informed Phillips & Powis that the idea was still under consideration, but by early August they had decided against it.

There the matter rested until October 1941. Reports from the Russian front had then told of Russian pilots exhausting their ammunition and making dive attacks close to their quarries in attempts to intimidate German crews and who had, on occasion, rammed them, This prompted Air Marshal Ralph Sorley, who had done so much to promote the British eight-gun fighter, to suggest what he called a 'tail tickler'.

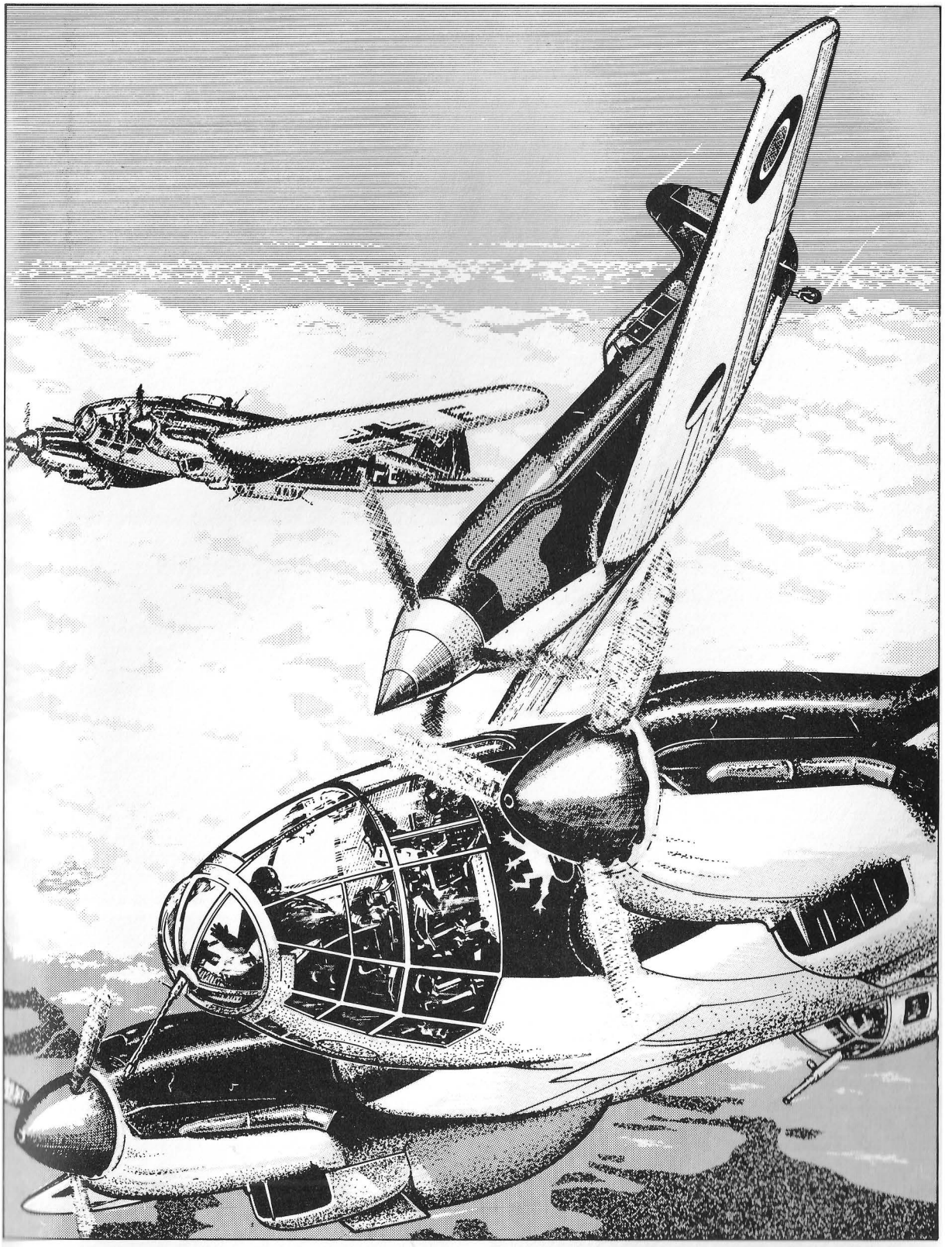
He envisaged a rigid tube fixed under each wing and extending forward as far as the rigidity of a light tube would permit, reckoned to be about 20 feet. On the end of each tube could be placed a charge of about 2 lb which could be electrically exploded by the pilot. His task would be to place the charge below the tail of the enemy, in contact with or just above, and explode it. This would have been just as effective as striking it with a propeller. There would be two chances of success. It was agreed that such a device be intended for use only when ammunition ran out. It would have been easy to fit and certainly safer than anything the Russians indulged in.

Doubts were expressed as to whether pilots would take kindly to closing in the face of return fire. British pilots, it was pointed out, tended towards more conservatism and less fatalism than the Russians. If the charge could harm the enemy it could also easily damage the attacker. A fighter fitted with the device would have its performance reduced, something no fighter pilot would countenance. Landing, too, might pose problems. Once more any form of ramming was discarded.

Bright ideas still continued to pour into Whitehall, ramming being a popular concept. In April 1943 Alfred Nasbet came forward with his Nasbet twin-engined rammer. Unarmed but heavily armoured in the nose, it would carry a shock absorber and ram which, driven by a spring, would hurl forward a short pipe which the inventor had tested from a car travelling at 70 mph. His was a recoilless weapon built for him by Messrs Carey of Manchester, the largest spring makers in the world. He offered the Air Ministry two sets of his device claiming it would make Britain 'master of the air'.

'Get it on to a plane and it will be the talk of the world', he claimed. To Air Marshal Douglas Evill he wrote, 'Never mind the Air Ministry, use your own brain which I am told is a good one, and I wish you every success in your new appointment. I can let you see one of my shock absorbers at any time. It is only 14 inches long and the ram can be any length from four to six feet to keep the plane away as far as possible from the enemy.'

No one ever took it really seriously — and this was also the fate of the British rammer. □



Dramatic impression of Mr Shamah's proposed rammer fighter just before hitting an He 111 (Drawing by David Dean)

COMMANDO 'CHOPPERS

Paul Beaver provides background and modelling details of Royal Marine Commando helicopters

Although not widely known, the Royal Marine Commandos have a fully fledged Air Squadron to support their deployments world wide. However, unlike their counterparts in the United States, the Royal Marines are an integral part of the country's Navy. The 3rd Commando Brigade Air Squadron (3 CBAS) does not totally rely on support from the Fleet Air Arm, but because of their military task, the Marines cooperate closely with the Army Air Corps. This is particularly apparent when one considers the helicopter equipment flown by 3 CBAS — namely the Gazelle AH 1 and the Scout AH 1 (the latter being replaced by the Lynx AH 1 at the time of writing). All these types were pioneered into service by the 'Pongoes' at Middle Wallop.

Organised into four flights, 3 CBAS is based at Plymouth and in Scotland, and in a war situation would most probably operate in Norway, to strengthen NATO's northern flank. Because of this orientation, the squadron regularly goes on exercise mountain-flying in the Pyrenees and snow-flying up in Norway.

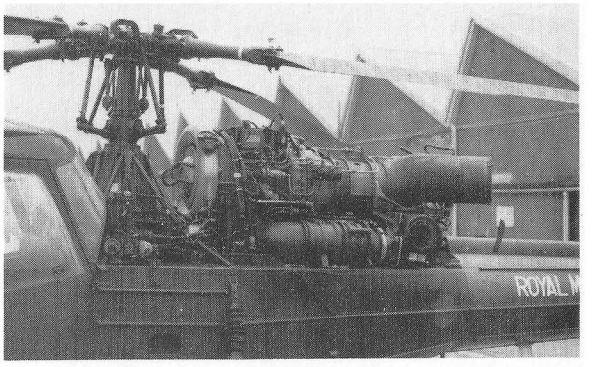
An important part of the Marine flyers' training includes operations from LPHs (Landing Platforms Helicopter) — what most of us call a carrier or assault ship. Various procedures are developed for carrier flying, including the preference of landing on the *Hermes'* side lift to facilitate easier handling into the hangar. The squadron's Gazelles carry their handling wheels on the skid-bar when operating in these conditions and these are levered down to allow the aircraft to be wheeled away.

Because of the amphibious mission, the Scout helicopter is equipped with Wasp-type flotation gear, which appears as 'wings' above the cabin when carried. These are coloured a mid-brown or olive drab in normal conditions and are usually only worn when the squadron, or detachments, are operating from a waterborne base. However, 3 CBAS aircrew always wear the standard green life-jackets irrespective of their task that sortie. In fact, all their flying gear is dark green even down to their gloves.

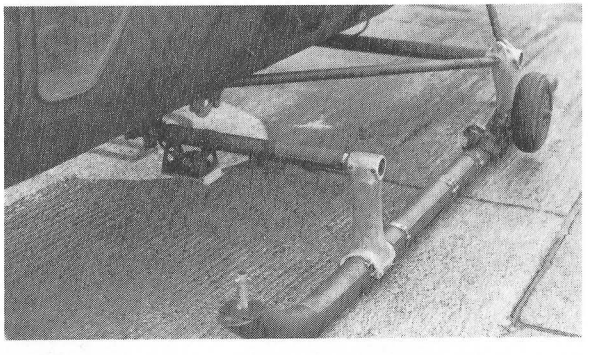
An interesting little gadget which is only carried on RM Scouts, is the Radio Altimeter (or RadAlt) worn on the skid bars — one receiver and one transmitter. As these are small the modeller will not be able to produce much detail in this respect. A UHF radio aerial is carried on the starboard skid and, not featured in the Airfix kit, a UHF aerial on the port side of the nose.

The Scouts are also equipped to take the SS 11 wire-guided anti-tank missile when necessary. Each aircraft can carry four missiles on booms exactly the same as Army ones. Casualty evacuation (Casevac) is another feature of RM helicopter operations, and the Scout is equipped with a totally enclosed stretcher case carried above the skids. Stretchers can also be carried inside the rear cabin.

The Gazelle AH 1, that highly manoeuvrable French helicopter which replaced the Sioux in the summer of 1976, is basically similar to the kit produced by Airfix of the Army version. Again, however, the important difference is the over-sea role



Facing page *A Royal Marine Gazelle during Exercise Whiskey Galore 77 in the Outer Hebrides* (Commando Forces News Team). **Above** *Tail boom detail of Scout AH 1 XP902:E.* **Above right** *Engine and rotor detail on the same machine.* **Right** *Scout nose detail showing the blade aerial which must be added to the kit. Note large white code and Union Flag.* **Below and bottom** *The handling wheel is in the down position while cleaning is carried out after servicing XP907:F.* **Bottom right** *Skid detail showing the RadAlt (*all photos by author).



A Gazelle of the now disbanded Salerno Flight, Malta, landing on HMS Kent, *the 'County' Class DLG, in March 1976* (L. A. Tuttle, 41 Commando).

which necessitates the fitting of flotation gear carried between the skid bars. These bags keep the aircraft afloat for several minutes in the event of a ditching, and take only 2.5 seconds to inflate.

Some Gazelles do not yet carry the UHF radio aerials under the nose, which correspond to Parts 39 and 40 in the kit, for example Gazelle AH 1 XX383:C, although it is hoped that all will in due course.

As has already been said, snow or Arctic operations are practised regularly. However, in peacetime it has been decided not to temporarily paint or emulsion the aircraft with white because of the problems this can cause the maintainers. In a war situation though, the dark green of the aircraft would be replaced with white (for winter operations in Norway), leaving Gazelles and Scouts with a white and black scheme. The white legend 'Royal Marines' and the individual codes would also be painted out in black. In early 1977, several machines were marked in black, but this policy was changed with the coming of a new Officer Commanding the squadron. The Union Flags carried on each aircraft's nose would also be deleted, these being carried in peacetime for 'showing the flag'.

Snow operations present all kinds of difficulties and this is when the RadAlt comes into its own, helping the pilots to make a gentle landing. These pilots are Marine Commandos first before becoming flyers and one is surprised by the number of pilots who are Sergeants.

The Gazelles are painted in the dark green and black scheme as used by the Army Air Corps. Roundels are the standard low visibility type of 200 mm diameter; the letters 'Royal Marines' carried on the fuselage side (130 mm high) are painted on the aircraft whilst the 200 mm serials are taped on to the fuselage. The kit supplies decals for the Army machine and several of these can be utilised for the Marines' machines. Only the actual aircraft serials, code letters, Union Flag and 'Royal Marines' legend need to be obtained elsewhere. The Union Flag is worn on the nose above the fresh air inlet with the white code letter below it on the battery access panel, and a similar letter can be found on either side of the fin. The yellow line decal from the engine to the toe step in the fuselage should be a dotted line and not unbroken as in the kit.

On the tailboom, the two radio aerials are black with thin silver leading edges. The rear end cover is not found on RM machines and the modeller will need to do some shaping to give a true representation. The shaft (Part 30) is mid-grey in colour. The engine colours are as per the kit, except the mid-exhaust section which is mid-grey.

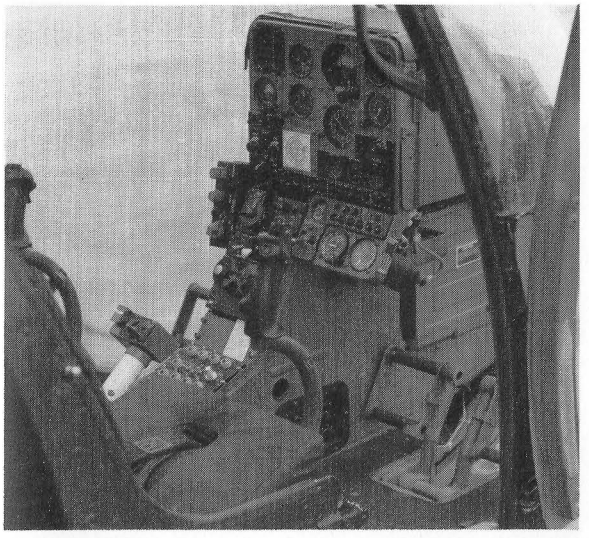
The Scout, now ageing fast, is painted the same dark green and black and marked in the same way as the Gazelles except they do not appear to carry tail codes, but on the nose the white code letter is worn above the Union Flag. Some Scouts, eg, XP907:F, have the white code on the fuselage side. The tail rotor certainly stands out when one sees the Scout because of its black and white markings which replaced the original red and white tips some time ago. An interesting feature is red 'No handling' markings on either side of the tail stabiliser (Part 28).

Unfortunately, the kit does not include the manhandling wheels which are carried on the skids just forward of the skid bars. One should also make a small UHF aerial to be carried on the nose, being coloured light grey with a green/white/green band in its centre. The skid tops and engine platform have mid-green non-skid patches. Main rotors are black with yellow tips as with the Gazelle and most other military helos. The roof screens are blackened with a detachable patch over the aircrewman's seat (port side) for the SS 11 guidance system.

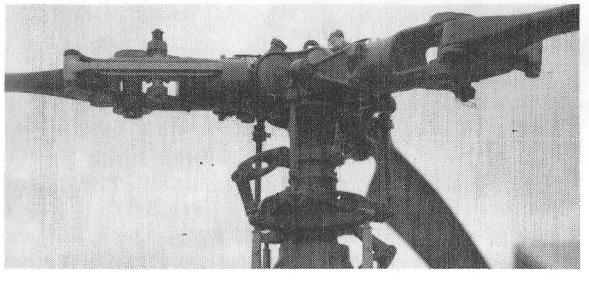
Both helicopter kits have well-detailed cockpits and cabins and so a corresponding amount of extra detailing can be applied. The Gazelle has dark grey floors, walls and seats with dark grey front seats and a light grey rear seat. Black harnesses and floor mats are used. The collective (Parts 1 and 7) is white with a chrome scale (Part 1 only). The battery panel is light green and found forward of the instrument panel.

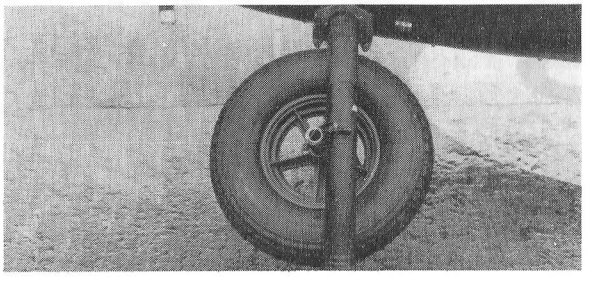
The Scout needs the provision of a rear seat across the cabin which is coloured black with blue harnesses. The front seats and harness are black, but the rest is dark grey.

This look at the machines of the 3rd Commando Brigade Air Squadron (3CBAS) would not have been possible without the kind permission of Commanding Officer Major Colin Howgill, RM. Acknowledgements are also due to Lieutenant Steve Bidmead, Sergeant George Bryant and Sergeant Bob Parry of the Royal Marines. □



Above *Gazelle cockpit detail.* **Right** *Nose detail of Gazelle AH 1 XX376:K of 3 CBAS. Note code letter and Union Flag.* **Below** *Rotor head detail.* **Below right** *Close-up of the removable handling wheel.* **Bottom** *Tail rotor detail showing the white individual code letter 'K' of XX376 of Kangaw Flight, 3 CBAS. Note non-standard red on white 'Danger' marking on port fin* (all photos by author).





HAVE A HART

Charles Bassett outlines the history of this famous biplane family

If a ratings chart was made of all the aircraft that have served both in the Royal Air Force and the Fleet Air Arm, it seems likely that although the Hawker Hart would not occupy the first position, it would most certainly be in the top ten. To me, the Hart personifies the might, or lack of it, of British military aviation in the inter-war period and a closer study of the type shows that it, with its predecessor the Fairey Fox, had a marked influence not only on light day bomber design of the 1920s and the 1930s, but because of an overall improvement of performance, fighters as well.

Up to the first flight of the Fairey Fox, light day bombers in service in Britain had for the most part relied on a radiator for air cooling, not in appearance dissimilar to the one used by the motor car. Then with the Fox and later the Hart, chemical cooling in combination with a much smaller radiator, or radiators, was used and as a result a more streamlined appearance was possible.

The Fairey Fox had first flown in January 1925 with an American Curtiss engine (known in Britain as the Felix) but as a result of the great Government economies in force at the time, only one squadron, No 12, was ever equipped with the type. However, the stage had been set for further development along the same lines and in June 1928, the Hawker Hart prototype, serial numbered J9052, made its first flight. It had been built to Air Ministry Specification 12/26 and first flew from Brooklands.

It was powered by the new Rolls-Royce Kestrel in-line engine and represented such an improvement over other types that it was very much faster than contemporary fighters such as the Gloster Grebe and the later Gamecock.

The Hart was the work of one of our greatest ever aircraft designers, Sydney Camm, who was later to be responsible for such masterpieces as the Hurricane, Typhoon and Harrier and who is so important that to-day he is afforded a corner to himself in the RAF Museum at Hendon.

The Hart went into production following Air Ministry Specification 9/29 and first joined No 33 Squadron as a replacement for Hawker Horsleys in early 1930. As a bomber, it was known both as the Hart 1 and the Hart (SEDB), the letters standing for Single Engined Day Bomber. It had a 525 hp Rolls-Royce Kestrel in-line engine and a top speed of 184 mph. The wings, which were staggered and of unequal length, were at their greatest span 37 feet 3 inches. The armament comprised a fixed forward-firing synchronised machine-gun for the pilot mounted on the port side of the front fuselage and another one, a movable Lewis, in the rear cockpit for the observer to use. The total bomb load was 500 lb.

It was such an important design of the inter-war

Facing page *Hart of No 57 Squadron* (Flight). **Above** *The Hawker Hart prototype with Rolls-Royce Kestrel engine as it appeared in the summer of 1928* (IWM). **Below** *A production model Hart showing the typical finish of the period before rudder stripes were dropped* (IWM).

years that it saw development in many directions — the Audax for Army use, the Hardy for general purpose and finally the Napier-Rapier engined Hector. It was used for training as well as bombing and general purpose duties, and with the ultimate development in the shape of the Hawker Hind, it played an important role in the muscle-flexing operations of the RAF leading up to World War 2.

To return to the Hart, some 984 machines were built in all. Of these, it is reckoned that about 50 per cent were finished as trainers with machines being built both by the parent company and Armstrong Whitworth, and some by Glosters and Vickers.

The serial numbers of bombers were as follows: J9052 prototype, J9933-9947, K1416-1447, K2424-2473, K2966-3030, K3031-3054, K3808-3854, K3855-3872, K3875-3904, K3955-3972 and K4437-4495. In service, as well as with No 33 Squadron, the Hart was used by numbers 12, 15, 18, 40 (for a short period only), 57 and 142 Squadrons in Britain while in India, the type flew with numbers 11 and 39 Squadrons, and in the Middle East (Egypt) with No 6 Squadron.

The usual finish was silver doped all over with Type A (red, white and blue) roundels on top (upper) wing, lower (bottom) wing and on the fuselage sides. Rudder stripes were featured on the early machines up to 1934 but then the RAF became more speed con-

Left *The ultimate in Hart development as far as the day bomber was concerned was the Hind. This is the first production model* (IWM). **Below** *Another of the Hart developments, the Audax* (Flight).

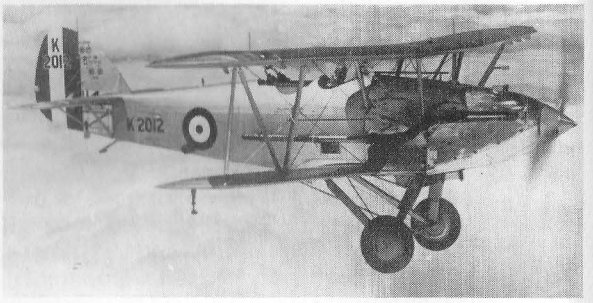
scious and rudder stripes were abandoned altogether, and all roundels made smaller and clear of moving parts. Serial numbers were in black on the rear fuselage ahead of the tail and on the rudder in eight inch figures as well as in the usual reversed style under the wings. Under the port wing, they faced forwards while on the starboard one, the top of the letter/number combination was against the wing trailing edge. Trainers were generally similar but they employed, prior to Expansion Camouflage, first silver and then yellow overall. With the introduction of camouflage, brown and green uppers of the disrupted kind constituted a third variation on the basic scheme.

Squadron markings on Harts took on two basic forms: at home units used squadron numbers painted in various sizes and positions on the fuselage sides, while in India in the mid-1930s, RAF machines including Harts, used a system of fuselage squadron bars not unlike those developed from 1916 onwards by RFC/RAF squadrons. As far as the squadron numbers at home were concerned, these were made further descriptive in that they were painted in Flight colours, *viz* red for A Flight, yellow for B and blue for C. Black framing was sometimes employed.

The Hind, which was the other bomber variation on the Hart theme, had a more powerful engine with improved installation features and a redesigned observer's position. It played a very active part in the RAF build up prior to World War 2 and it served with some 25 RAF squadrons at home as well as 11 more in the Royal Auxiliary Air Force. It followed in general the colours as described for the bomber and trainer Hart versions referred to above but with the modifications mentioned. It did not enter service with the RAF until 1935 and rudder stripes were therefore not carried by any Hinds.

Having referred to the Hart family in general terms, I now propose to deal with the squadrons of Hart bombers proper and give examples as to coloration in more specific terms:

No 12 Squadron was originally chosen to fly the



Fairey Fox and from 1924 until late 1935, was based at Northolt, Middlesex. Then it moved to Andover, Hampshire, where it continued to be stationed until it moved overseas in October 1935. It first received the Hart as a Fox replacement in January 1931 and was flying them until late 1936 when they were replaced by Hinds. A large number '12' indicated the squadron and this was carried ahead of the fuselage roundel. Some machines photographed in 1935 were finished as described above but without rudder stripes. The fin did, however, feature the fox head circle badge of No 12 Squadron and the wheel discs and the number '12' were in red, indicating A Flight. Two examples finished thus were serial numbered K1419 and K3009.

No 15 Squadron received its Harts as a Horsley replacement in the summer of 1934 when it was based at Abingdon, Berkshire. It retained the type until 1936 when they too made way for the Hawker Hind. The Harts were finished in accordance with the all-over silver finish described earlier but the squadron is unique in that not only did it carry its squadron number ahead of the roundels on the fuselage, but these were in Roman numerals. In 1936, the machine of a Squadron Leader was photographed with plain wheel discs but a red XV. It had a Squadron Leader's badge on the upper fuselage just behind the rear cockpit and a bare rudder. A squadron badge was featured on the fin, with the serial number K3900 on the rudder, rear fuselage and under the wings.

No 18 Squadron was formed with Harts in 1931, keeping them until replaced by Hinds in 1936. During its period of service on the Hart, it was stationed at Upper Heyford, Oxfordshire, and one of its B (yellow) Flight machines photographed in 1934 was numbered K2432. It had a yellow, framed black number '18' ahead of the roundel, yellow wheel discs and rudder stripes with red leading. The squadron number on these machines was rather smaller than the normal.

No 33 Squadron was the first Hart squadron, receiving them in 1930 as Horsley replacements. It was based at Eastchurch, Kent, but later in 1930 was moved to Bicester, Oxfordshire, thence to Upper Heyford in 1934 and finally to Egypt. Squadron numbers were rather small and were painted as '33' above the roundel. A C Flight machine had this number in blue framed black with red leading rudder stripes and the serial K2443. The squadron's 'deer head' facing badge was featured on the fin.

No 40 Squadron used the Hart as an interim type for a few months in the 1935-36 era, the number '40' being carried ahead of the roundels. K5465 was an example with no rudder stripes with A Flight.

No 57 Squadron used Harts from late 1931 until May, 1936, then went on to Hinds. It was based at Netheravon, Wiltshire, from 1931 to 1932 from where it moved to Upper Heyford. A large '57' was carried ahead of the fuselage roundel. K2466 of A Flight had no rudder stripes, the red number '57' framed in white and red wheel discs.

No 142 Squadron used Harts from 1934 to 1936, then it received Hinds. It was based until 1935 at Netheravon thence to Andover and in October 1935, to Egypt. An example of A Flight without rudder stripes was K3959 with the '142' ahead of the roundel.

In addition to the above, the Hart was widely used by the RAuxAF in the 1930s. In most cases, it again played an interim role, replacing older types and preparing the squadrons for better things to come.

In India, the Hart was used by:

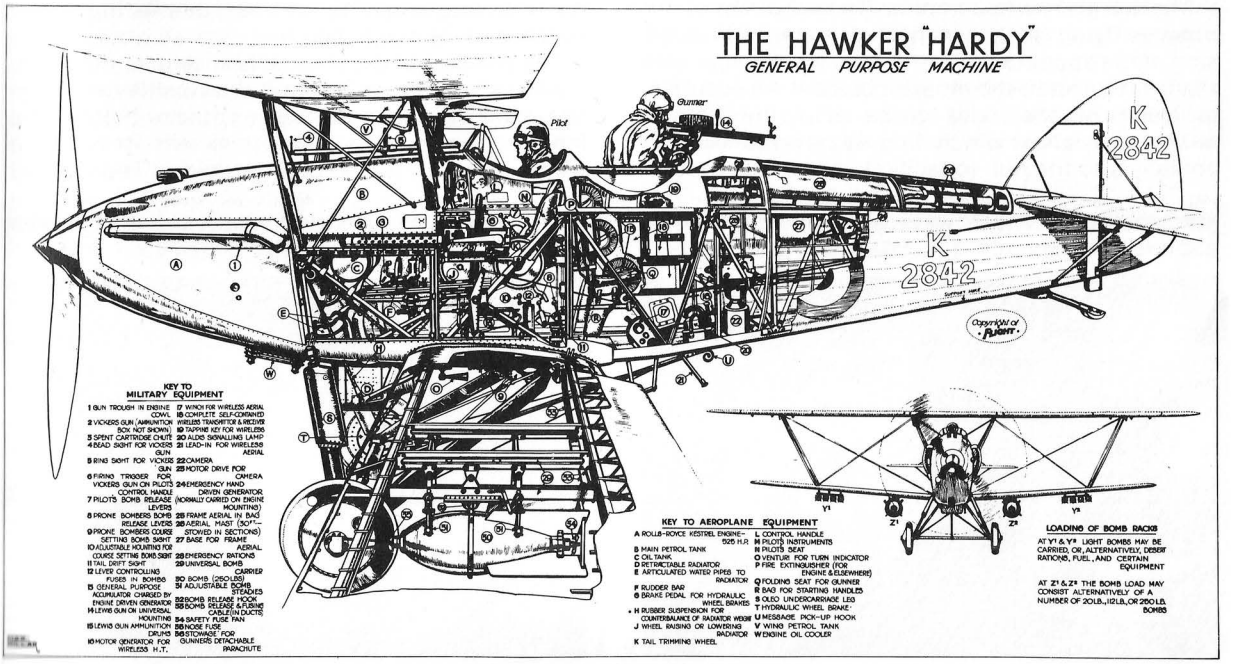
No 11 Squadron which carried two red bars (vertical), one behind and one ahead of the roundel. No rudder stripes were used by K2109 in 1937 and a squadron badge in a grenade shape* was featured on the fin. Marking varied on later machines — in 1938 for example, two bars aft of roundel.

No 39 Squadron A Hart with this unit did not have rudder stripes but within a grenade shape and squadron badge, K2096, with one black (vertical) band just behind the rear cockpit and a second ahead of the tail. A '2' (aircraft in squadron number) ahead of the roundel.

There can be little doubt that the Hart played a significant part in the shaping of the RAF in the 1930s, a fact that has made its presence felt even in the designs which are current today, in the late 1970s. Looking back, it is difficult to see how we in these islands could have won either the Battle of Britain or indeed World War 2 without the minor revolution in aircraft design which was started by the aerodynamically clean and therefore, very fast (compared to contemporary fighters) Hawker Hart and its various offspring which served widely in the armed air forces in Britain during the formative years of the 1930s. □

**In 1936, fin shapes in conjunction with squadron badges were introduced, ie, spearhead — fighters, grenade — bombers, star — army co-operation.*

Another Hart development was the Hardy, shown in this cut-away drawing from Flight.



SUNDERLAND in close-up

1

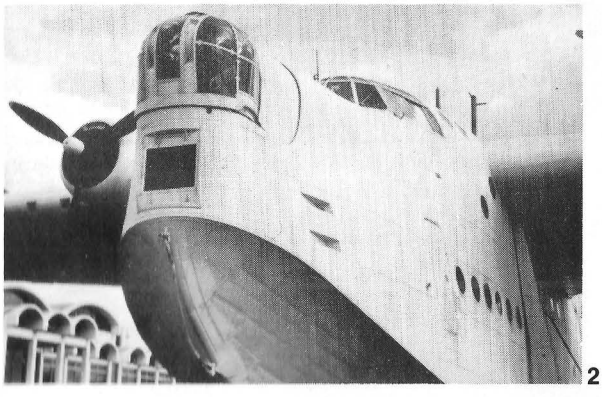
Peter G. Cooksley and camera at the RAF Museum provide inspiration for super-detailing

Short Sunderland ML824, the bulk of which dominates the front of the RAF Museum at Hendon, began life as a Mark III and so was one of those with a modified hull planing bottom with the forward step considerably reduced in depth (as in the Airfix kit). However, it was converted to a Mark V as it now is and stands braving the elements (Photo 1) in the colours of No 201 Squadron which was finally stood down at Pembroke Dock in January 1957.

Photo 2 gives a fine impression of the size of this massive flying boat as well as giving some impression of the appearance of the nose window beneath the front turret in the closed position. An even better idea of the nose turret and the section immediately aft by which it could be retracted horizontally into the hull to facilitate mooring is shown in Photo 3. This cupola boasted two 0.303-inch machine-guns. These were augmented on some aircraft by four more of similar calibre but which, being fixed, were fired by the pilot. The idea of the combined fire was to clear the decks of U-boats before they were dealt with by means of depth charges if they were discovered on the surface.

The type of view afforded by the wide, high cockpit is shown in Photo 4 where such additional details of interest to model builders as the windscreen washers and windscreen wipers may be clearly made out. The heavy steel cable, part of the mooring gear, is another interesting detail which is shown in Photo 5.

The position of the cockpit is shown in relation to the entrance door in Photo 6. Just inside here were two staircases, one leading up to the flight deck, the other down to the lower deck with its mooring winch, washing facilities and lavatory. The tapered leg of the beaching chassis is visible under the wing which may give modellers some fresh ideas on the subject of displaying their skill.



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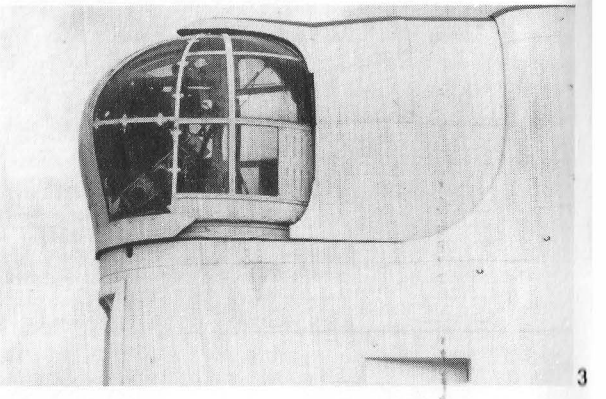

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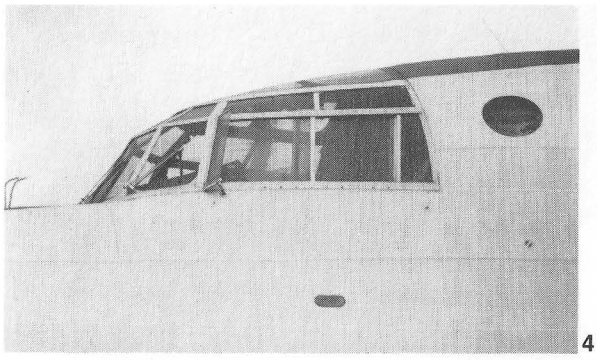

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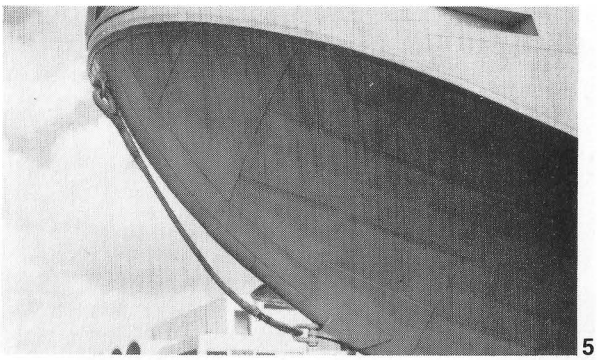

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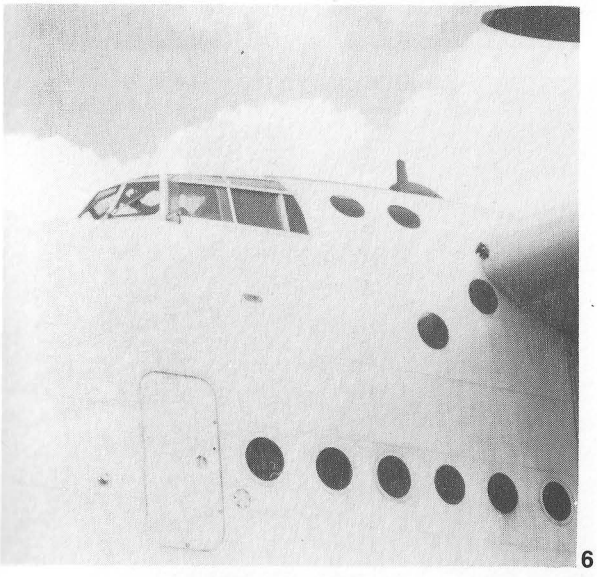

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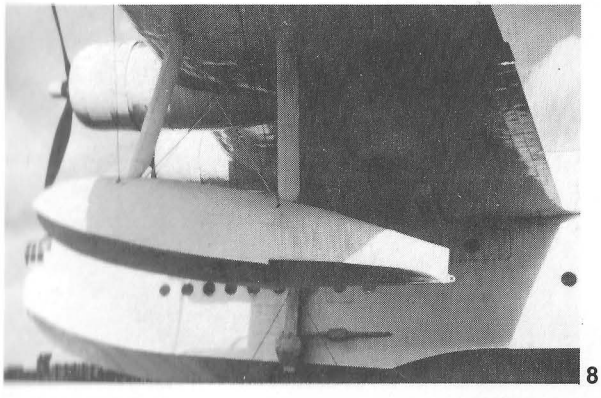
Photo 7 gives a good idea of the line of the cowling for the inboard Twin Wasp motor, beyond which are to be seen two of the aerials. A side view of the port outer engine is to be seen in Photo 8, together with such valuable details of the tip float as the attachment points of the bracing and the eye at the rear. Here also are the lower parts of the beaching leg and its attachment.

Some Sunderlands of this Mark had the dorsal turret commonly found on the Mark III replaced by 0.5-inch beam-mounted guns and ML824 is no exception (Photo 9). Note too, in this view the whip aerial above and aft of the letter to the rear, while Photo 10 shows clearly the details of the mobile rear support.

Study of Photo 11 will be repayed by a realistic impression of the size of this monster as well as showing several panel lines and the twin wheels on the beaching leg.

The play of the light through the elevator hinges in Photo 12 picks them out admirably for model-makers and those on the rudder are similarly



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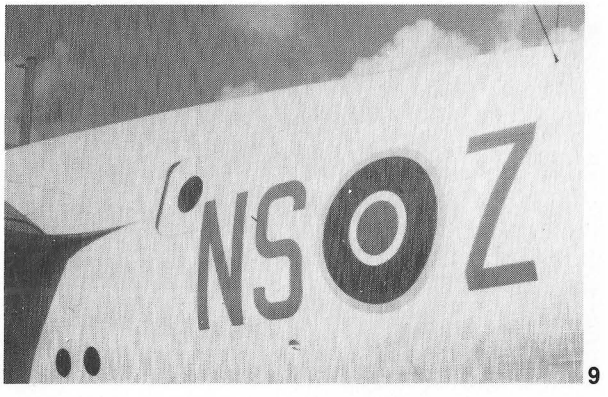

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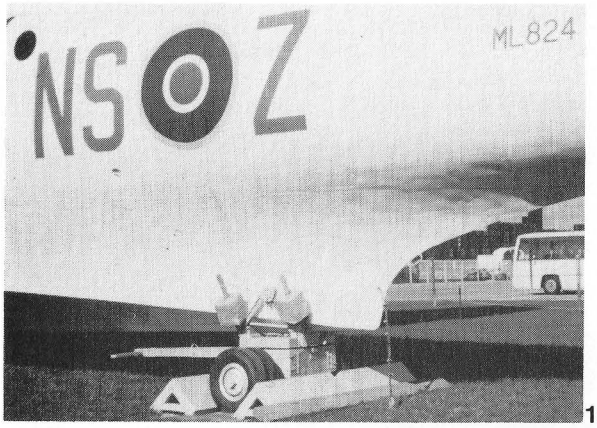

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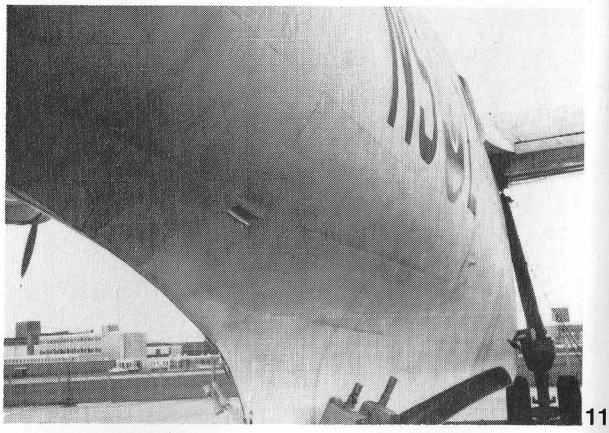
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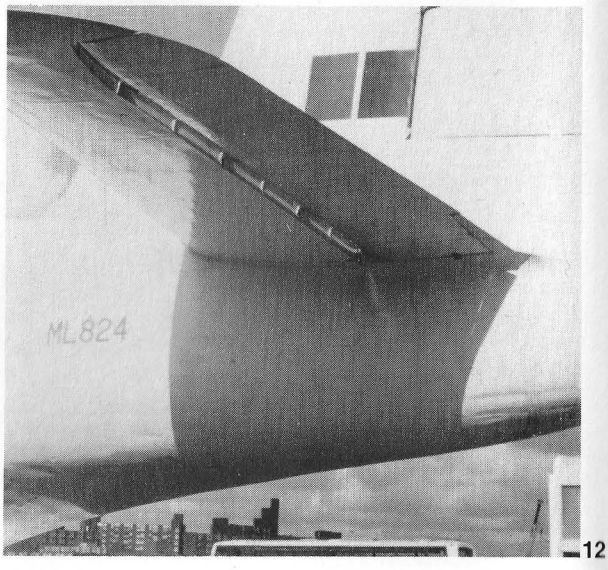
shown in Photo 13. Below this (Photo 14) was the power-operated rear turret, now bereft of its 0.303-inch machine-guns, four of which contributed to a withering fire from the tail. Also of note are the valuable details of the rear navigation lamp and the hand grip below it. □



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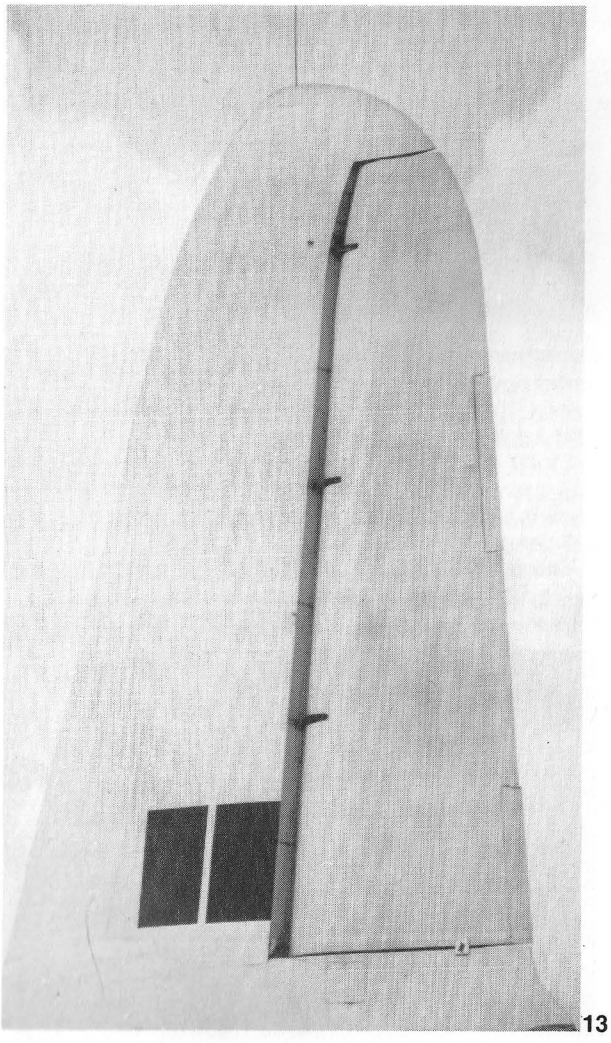
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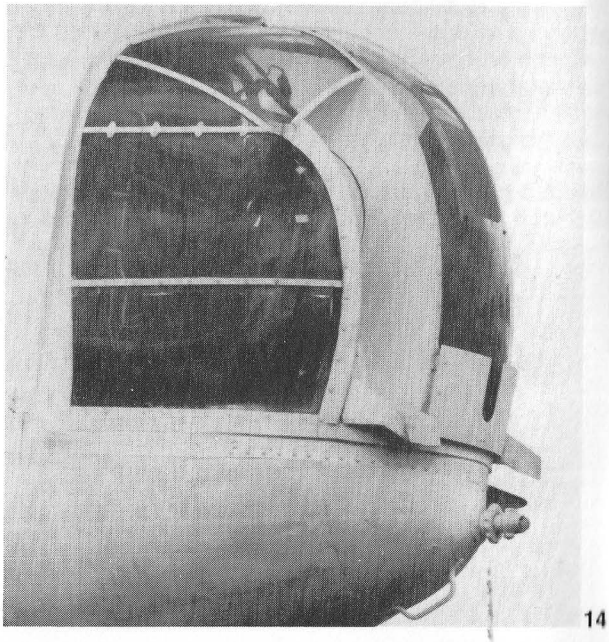
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